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Science-fiction

JUNE 1944

25 CENTS

TROG

BY MURRAY LEINSTER

ASTOUNDING SCIENCE-FICTION JUNE 1944

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JOHN W. CAMPBELL, JR.

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The Difference

In many engineering operations, the useful product is the difference between two quantities—actually, of course, that's true of practically every process except heating, where one hundred percent inefficiency can be interpreted as one hundred percent efficiency. But I have in mind such things as heat engines, wherein the available energy for use is determined by the difference between the starting and exhaust temperatures. Whereas an inefficient electric motor, or any other secondary power device, can be driven to function by simply pouring in enough power to do the job and still supply all the losses, heat engines, characteristically our prime power sources, can't be tricked that way, save in the case of the reciprocating steam engine. There you can get away with some colossal inefficiencies—or Watt would never have become the name of a unit of power. But a reciprocating steam engine is as subtle as a sledge hammer. It's the quickest, cheapest, easiest solution when you've got unlimited resources to back it up. And it always works.

But in engineering, more efficient, neater ways of doing things pay dividends. The low-efficiency, low-pressure steam engine of Watt's day became the high-pressure triple-expansion, more efficient reciprocating engine, then yielded to the higher pressure, N-expansion turbine. The pressures have been going up steadily since then; many power plants that represented the last word of efficiency when installed in 1925 have been modernized and made more efficient by installing topping turbines that work at pressures so high the exhaust steam of these new jobs is still at the intake pressure of the older turbines!

The increasing pressures represent simply efforts to operate with a maximum difference in temperature. It's that difference that counts—the difference between T_1, the intake temperature and T_2 the exhaust temperature. The greater that difference, the higher the efficiency.

Of course, any system that burns fuel to heat a boiler to generate steam to run a turbine has a lot of losses before it reaches the intake point. The fuel-combustion gases have to be hotter than the boiler—otherwise no heatflow. The boiler has to be hotter than the steam—or no heatflow. To be really efficient, the hot fuel gases themselves, not steam indirectly heated, should be fed into the intake—

An obvious point, and one that was realized long, long ago. The efforts in that direction have been many and, for long decades, fruitless. Making a gas turbine is a beautiful concept, but it involves a few little engineering snags that turn out to be perfect dingers. You want your gases hot? Brother, when you burn fuel oil in compressed air, you've *got* hot gases; now let's see you make a metal that'll stand that ferociously corrosive atmosphere of incandescent gas long enough to do some good. You have your choice of burning the fuel with an excess of air, assuring complete oxidation, but also assuring a white-hot oxidizing atmosphere in your turbine, or using too little air, and maintaining a reducing atmosphere and fuel inefficiency. Unfortunately, the reducing atmosphere turns out to be somewhat more corrosive to usable metals than is an oxidizing atmosphere. All practicable fuels are carbon compounds; when such a fuel burns in an oxygen-deficient atmosphere it produces carbon monoxide. And that is pure poison to iron alloys, as well as to men, iron forms a long series of carbonyls, all nicely volatile, when hot carbon monoxide is around.

And, of course, if you cool down your combustion gases, you might as well use a steam turbine—

There's another stinger in that problem, too. Burning fuel in air means the air has to be gotten in there. If it's to work a turbine, there must be pressure, so the air has to be compressed, fed into the

combustion chamber, and the resultant hot, compressed gases work the turbine. Feeding "compressed" steam into a boiler is easy—you use water. Air has to be compressed by pumping, and if you're talking in terms of thousands of horsepower of output, it means pumps on a grandiose scale. The only practicable kind is the centrifugal pump or inverse turbine—a supercolossal supercharger, in effect. And compressing air on that scale is going to absorb horsepower—thousands of horsepower, just for pumping in the air to burn! Under those circumstances, "free air" is an extremely expensive commodity. Of course, if you had a one hundred percent efficient supercharger, and a one hundred percent efficient turbine, all that horsepower invested in pumping air would simply return—the good old perpetual motion scheme of the pump that fills an air tank from which compressed air is drawn to drive the air motor that works the pump. The turbine would just have to be made somewhat larger to handle the extra horsepower absorbed by the supercharger.

If, that is, the pump and turbine were one hundred percent efficient. They are not. Suppose each is ten percent efficient. The power output of the system will be the difference between the total horsepower developed by the turbine, and the total horsepower consumed by the pump and frictional losses. Sorry—no dice. You can drive the gadget with an outside power supply, but the turbine must produce one hundred horsepower to have the pump do ten horsepower work on the job of pumping air. To produce one hundred horsepower, the turbine consumes one thousand horsepower of heat energy, from burning air and fuel. And wurra, wurra—we discover it takes twenty horsepower of air-pumping to supply that air! No matter how you multiply that up or divide it down, it still won't work. Pouring in more fuel won't make it work either; it can't pour in the air to go with the fuel.

As the efficiency of turbine and blower are slowly increased, a point will be reached where the turbine can just barely turn its own blower. No power output available—but it will run, at least.

Finally, the successful gas turbine has been developed. It requires that the turbine and blower both be highly efficient. Research on high-temperature, corrosion-resistant steels finally produced one that could stand the gaff well enough to allow the high—and highly efficient—gas temperatures needed. Research on airplane superchargers, air-conditioning compressors, blowers for handling the huge volumes of compressed air required in various chemical industries led to increased blower efficiency. The curves of efficiency edged across the line between go and no-go, got a bit on the other side—and we have the gas turbine.

The net power output of a gas turbine is the difference between the large amount of power produced by the turbine, and the large amount consumed by the blower. The quantities are both large—larger by a very considerable margin than the output power, in fact. From this point on, each change of efficiency will tend to increase the turbine power and decrease the blower consumption; a small percentage change will, in consequence, have dramatic effects on the net output.

The gas turbine is inherently a more efficient machine than any other form of heat engine, and, short of atomic engines, our prime movers are all heat engines; it's a fair bet that only highly evolved atomic engines will, in fact, be other than heat engines themselves.

It's noteworthy that the jet propelled plane involves the use of a gas turbine system to provide the jet's compressed air supply—that it couldn't be made efficient until the gas turbine had nudged across the go—no-go line.

THE EDITOR.

* * * * * * * * * *

Trog

by MURRAY LEINSTER

***The** theory of a "mass consciousness" didn't set right—but somebody or something, somehow, was destroying America and the world. Industry, transport—everything falling apart—*

Illustrated by Orban

I.

Dick Drummond regarded the New York shore with a sort of shocked incredulity as the rowboat neared it. The girl beside him touched his arm, watching the oarsman. He rowed unskillfully, this oarsman, and his face was evil. But Dick's eyes swept back and forth along the water front with staring unbelief in them. He gave no sign of having noted the touch on his elbow. At only one place along the whole Hudson shore was there a tiny plume of steam. That was where a barge lay alongside a ship sunk at its dock, salvaging cargo from the swamped vessel. The other docks were lifeless.

But not empty. One stretch three city blocks long, to be sure, was a scorched mass of ruin, with the masts of three steamers standing up above the wreckage. But the rest of the water front seemed intact as far as the docks were concerned. Yet there was no sign of life. The monster liner *Queen Caroline* lay careened, her deckhouses crushing in the roof of the wharf beside her. The rest of the wharves had sunken ships be-

side them. Some few had settled upright. More leaned one way or another, and several lay on their sides with no human beings anywhere about.

The rest of the city was as strangely quiet. A horse and wagon crawled along the Hudson Drive. There was smoke from the chimney of a brown-brick building at Thirtieth Street. Somewhere up where Riverside Drive began there were a few bright spots which might have been children. But the city seemed to be dead. There were three steamers—one listing badly—at anchor down in the lower harbor, and a sailing schooner came down under the George Washington Bridge. That was all the water traffic. Absolutely all.

The boatman laid aside his oars and reached deliberately into his hip pocket, as if for a plug of chewing tobacco. But his eyes betrayed him. The girl said quietly:

"Trog, Dick."

Dick Drummond's hand came smoothly out of his pocket with an automatic pistol in it. It bore steadily on the oarsman.

"Hold it," he said mildly.

The man froze. His pistol was just halfway out.

"Up with the hands," said Dick, without heat, "and then turn around with your back to me. I don't like to row," he added, "so I'd rather not shoot you."

The man cramped his legs up over the thwart and turned to face the bow. He swore sullenly. Dick reached forward and took the weapon from his pocket. He handed it to the girl.

"Happy birthday, Sally," he said. "And I can't think of a more useful present, these days."

He patted the oarsman's other pockets, tapped him for a possible shoulder holster, and settled back in the stern again.

"You can turn around now," he observed, "and take us the rest of the way. You've been making a business of this? I didn't know things were quite this bad."

The man raged. But the automatic still bore on him. He pulled on sullenly. The New York shore came slowly nearer. Dick Drummond saw a party waiting for him. There was a civilian, and two or three men in uniform. He directed the oarsman, who snarled at him. The rowboat went in past a gray-painted tramp steamer which had sunk at its berth. The harbor water just covered its deck and little waves went in and out the open doors of its deckhouses. There was a flight of wooden steps down to the water from the shore.

The oarsman backed the rowboat to the steps so his passengers could get out. But Dick shook his head.

"No. You get out first, my friend. I want to ask a few questions."

Hamilton called down:

"What's the matter? Oh!" He'd seen Dick's automatic.

There were suddenly pounding feet. Two soldiers came down the steps. The bearded boatman swore horribly.

"I think he's a trog," said Dick.

"He started to pull a pistol on me out in midstream. Sally has it now. He's a looter, anyhow. Get out, guy!"

The boatman stood up sullenly—and dived overboard in a flash. The soldiers' rifles came up. His head appeared, but vanished again before they could fire. A soldier ran along the wooden walk overhead. The bow of the sunken ship was no more than forty feet from the rowboat.

There was a shot overhead. Then another. The soldier walked back. He had fired at something around the bow. He'd hit it.

"Got him, I see," said Dick.

He helped Sally to the steps. She was very pale. Dick fumbled at the stern seat on which they had been sitting. The middle board was loose—to make a locker for bait and fishing lines. But he looked in there and nodded.

"Loot here," he said distastefully. "You chaps will take care of it?"

He climbed the steps. A soldier made the boat fast and delved in the locker. Jewelry, Two pistols. A wallet and a fur piece and a woman's purse, and an assortment of odds and ends of value in these days. The boatman had evidently robbed other passtngers whom he'd agreed to ferry to and from New York.

"So this is New York!" said Dick, when he had climbed the steps. He shook hands with Hamilton. "It's changed in the past four years. Thanks for coming to meet us."

Hamilton said nothing. His face was oddly strained. He indicated his car and wordlessly led the way to it. It was one of the last cars made, a '52 model sedan with Ganish thermobatteries and electric drive. Hamilton had changed its heat supply to use wood, coal, or anything else burnable. A little bluish vapor came from its stack. Sally was already sitting in the back seat. Hamilton had two repeating rifles stuck in the robe rack. There was one bullet hole in the windshield. Hamilton got in and the car started off.

The streets were deserted. Shop windows were smashed. Three blocks from their starting-point they passed one complete block of buildings which had been gutted by fire. In the entire journey across town they passed less than a dozen people. But when they went by what had been a small green, block-square park they saw a great shallow excavation in which nothing grew, and two men and a woman were digging there, filling buckets. Hamilton spoke for the first time.

"They're taking the topsoil," he said heavily, "and spreading it on a roof somewhere. They'll grow vegetables in it. It's safer. There's a sort of patrol of the shore, by the Army, but there's still some looting now and then."

Dick Drummond was silent. Sally closed her eyes. She was still a little pale. Most people were hardened, these past four years, to things that before would have seemed monstrous or impossible. But Sally was upset, having practi-

cally witnessed a killing.

The car went uptown and over a bridge to Brooklyn. The East River was still and silent. They saw people here and there—perhaps eight in a ten-minute ride. Then they were in a sunken drive that went on and on and on.

"This goes out to the airport," said Hamilton, unnecessarily. "The plane should get in in a couple of hours."

Dick said rather oddly:

"I've heard about all this, you know, and there have been plenty of changes out our way, but it didn't seem really possible. Not really! I still can't believe it. I can't!"

"It's true enough," said Hamilton bitterly. "Man, the Master of the Universe! Getting to the point where he was almost his own master—where he'd cease to be an animal responding to his environment and become someone who would change his environment to suit himself! We were almost at that point. But the troglodyte in us—our mass consciousness, they say—couldn't stand it. So it took charge and pulled everything down."

"I deny that I am any part troglodyte," said Dick. "My consciousness works just like it always did or worse. But— That was a trog who rowed us across the Hudson, if you will, but I don't believe he'd be able to sabotage a water-supply system. He wouldn't know how."

Hamilton said:

"Mass consciousness—"

"I know!" said Dick. "Sally's father and Blaisdell and I do parapsychological research, even in these days. I know the theory. There is a mass consciousness with which each brain has a more or less tenuous contact. It accounts for telepathy and a few other things we haven't been able to explain with our brand of screwdriver research. But I haven't quite accepted the theory that people are sick of civilization, and every so often one of them will draw from that mass consciousness the impulse and the information he needs to smash up a power plant by reversing the polarity of a key relay—much less that there's a mass consciousness for the whole human race which can't stand civilization and has cracked up and set out to destroy it."

Hamilton shrugged wearily.

"But that's what's happened."

"Blaisdell, out at the laboratory," said Dick, "is constructively insane, I think. He has a trick way of getting the right answers, after starting with deliberately false premises. He gets interesting stuff, and a surprising lot of it is true, but some of his results are quite impossible. One of them says this could happen, but I never believed that New York could be quite what it is."

"All the main power stations went out within two weeks," said Hamilton. "That was three years ago. The water supply went out within the next month. Trains ran for a while after that, but it wasn't—nice. The Army organized evacuation after a fashion, but it was bad. Civilization's finished, Dick. Every other big city in the

world has gone the same way as New York. London, Paris, Moscow, Prague— You're holding on, and there are others like you. Little tool shops and laboratories and machine shops in towns and villages. That's going on all over the world. But it's hopeless. The human race is fed up with being civilized. Its mass consciousness has revolted. This is the twilight of the race."

"Except," said Dick, "that I've never heard anybody admit that his individual consciousness was fed up. It's always everybody else's. Every man I know wants to be civilized. Even trogs like that boatman—he wants civilization to go on, because he wants to rob people of civilized things."

"Maybe individuals," said Hamilton hopelessly, "but not the mass. And the mass is so powerful that any of us can be a trog—an actual trog—without knowing it. I haven't admitted this to anybody else, but I'm afraid I may have smashed the control panel in the airport control tower. It happened two days ago. We can't get another. Factories aren't making parts."

Sally opened her eyes. She looked steadily at the back of Hamilton's head, as he drove. The car went smoothly and swiftly along the Grand Central Drive toward the airport. There was absolutely no sound except the humming of wind around the car. The electric wheel motors were noiseless, of course. The Garnish thermobatteries were silent. But much more startling than the quietness of the car was the silence of the city. Once, every city had a voice. It was a dull, rumbling note which was composed of myriads of smaller outcries, and it changed from night to day, but never ceased. New York was silent now, though—and there were a surprisingly large number of birds about.

"I'd like to hear about it, Hamilton," said Dick, reservedly. "If you'll tell me, I'd like a lot to hear. We've been working on the trog problem—who hasn't?—but nobody has ever admitted to my knowledge that he might be a trog, except obvious psychopaths who were simply lying."

Hamilton turned up a ramp. He headed for a bridge which crossed the drive and led to the entrance to the airport.

"I was in the control tower," he said in a lifeless voice, "watching a plane come in. I remember thinking how clever the set-up was. Not a thing for the control operator to do except in an emergency. Relays and automatic controls handling everything. And then, suddenly—I hadn't the faintest sensation of a time lapse—the whole control panel was wreckage before my eyes. It was battered as if I'd been filled with a maniacal fury and had used every bit of technical knowledge I possess to smash just the irreplaceable parts. And there was a metal chair overturned by my side as if I'd dropped it when I came back to my senses. But it seemed to me as if it all happened instantaneously."

"No time lapse, eh?" said Dick,

keenly. "Did anybody see you do anything suspicious? How were your hands? Tired? Splinters of glass or paint on your hands?"

"Nothing," said Hamilton bitterly. "There were thirty people who to the outside eye were just as likely as myself to have done it. I gave the alarm, as if I'd discovered it the instant I went in. I should shoot myself, I suppose."

"Don't," said Dick. "Factories aren't making small-arm ammunition any more. Hm-m-m. Will you come out to the lab and let me put you through the works? You'll be manna from Heaven if you will. I'd give an awful lot for an encephalogram of an actual trog. mass consciousness or no. But what you've said fits in in a cockeyed fashion with what Sally's father has claimed and what Blaisdell's systematic insanity gives. Will you come back with me?"

"What good will it do?"

"Lots," said Dick. "Plenty! Lord, what a mess!"

They had entered the airport inclosure. Three of the hangars were hollow, glassless shapes of scorched steel. One had collapsed completely. And there was a pile of shattered, scrapped aircraft and aircraft parts at the side of the field which should have been hidden from public view.

"Every so often something else goes," said Hamilton. "The Army's using this field now. They had trouble with their own. Trogs would take explosives and use 'em on the planes. They only land planes over there now when they need explosives."

"But what—"

"No fire department any more," said Hamilton. "Fires get started sometimes, and burn and burn. I don't know why, but the Army thinks they ought to be stopped. So they bomb a fire barrier. The human race has stood civilization too long. That is admirable, maybe, trying to keep the cities intact in case we can ever move back. But civilization has been a cumulative strain. And now we're cracking up. Not as individuals, but as a mass, we've developed a colossal subconsciousness hatred of civilization. So as individuals under compulsion we smash the part we're most familiar with—or smash something anyhow. But I helped design that control panel—"

He swallowed.

"We've been too civilized and the race can't stand it. We've cracked. We'll sink back to some level of culture that we can stand. Like the Dark Ages, maybe. For nearly a thousand years the race stood still then. Maybe that's the optimum. Maybe that's the limit of civilization human beings can endure. Ants and bees have found a level of civilization that fits them. Why

not human beings? We tried to go too far—"

There was silence. Dick Drummond stared around the huge airport. It had been named for a now forgotten mayor of New York, and at one time, right after World War II, it had been the center of airborne traffic for the metropolis. After jet propulsion came in, it was even overcrowded. But then planes began to land on their jets, requiring no landing run, and the number of landings went up from a bare three thousand a day in '45 to ten and fifteen. In '50 it was twenty thousand a day. Now the three in the car sat in the midst of a vast inactivity. Someone was tinkering with a refractory jet motor in a hangar not far away. Otherwise there was not a single movement of any sort in what had been the busiest airport of the greatest city in the world. In three-quarters of an hour not a single plane landed or took off. Nothing happened. Nothing whatever.

To two of the three, this stillness was the sort of tragedy which must crystallize into action. Dick Drummond had been living and working in a small New Jersey town, in a laboratory partly financed by himself. There had been trouble and tragedy in plenty there, when civilization seemed to crumble under its own weight and weariness. The town has been under siege for three weeks just after the evacuation of New York in '52. All the millions in the metropolitan district had to be evacuated from cities which could no longer be lighted or fed or supplied with water. After the evacuation, the looters came. They were dregs of the population of the emptied cities, who had hidden or refused to leave; who stayed behind to loot abandoned homes and warehouses. When military force was used to clear the cities of them, they surged into the open country. They ravaged farms. They turned highways into ambushes. Sometimes they attacked small communities and committed monstrosities of crime in the quest for food. It took regular military operations to exterminate them. Even now the highways were not safe, and highways were almost the only aspect of civilization which did not touch off the madness of the trogs.

Dick and Sally had seen the evacues and they had fought the looters. But it had still not been possible to imagine the world's greatest city reduced to a desert with less than the population a similar area in farmland could have maintained. There were probably not more than three thousand people still living on Manhattan Island. Dick and Sally had heard it. But until now they had not been able to believe it.

Even now, their brains would not quite believe that the same thing was true of all the world. A passion to smash civilization seemed to have swept every nation and continent. Individuals apparently went mentally blank, their twentieth-century personalities pushed aside by a troglodytic entity—the hypothetical mass consciousness—which took

the normal brain's technical knowledge and used it to strike at the civilization the troglodyte could not endure. The damage was rarely impressive in quantity. Its deadliness lay in its kind. Hamilton's suspicion that he had smashed the control panel at the airport was a case in point. The relay tubes could not be replaced because the factories which should make them could not operate. They could not operate because railroads could not bring them materials or fuel, because of simple but fiendishly devised destruction in essentials to transportation. All cities were without lights or power or water or food.

Over all the world the situation was nearly the same. There were factories in New York, in Paris, in London, in Milan, which had suffered no slightest harm and were ready to the last tool to continue production. But they could not turn a wheel for lack of power, and their workmen had long fled to the countryside in hope of food. Nine-tenths of the industrial production of the United States had stopped because of the destruction of perhaps one one-hundredth of one percent of its equipment. Then the balance had stopped because nothing could be done with what was produced.

A hydroelectric plant is a small fraction of the machinery which will be made useless if it ceases to work. But a section of bus bar laid across a main power switch can burn out every operating dynamo in thirty seconds if the time is chosen just right. And it always was. A twenty-pound strip of bar copper wrecked the generators at Boulder Dam. The Tennessee Valley burned out when somebody switched conductors suddenly, and the dynamos burned each other out. The dynamos could not be repaired. All power plants were incapacitated by precisely managed destruction, seemingly carried out by madmen. City water systems ceased to function when trogs smashed their pumping systems or smashed spillway gears. What trains ran, dared only crawl because trogs had smashed too many switches and reversed too many signals. Steamers in port sank at their docks with opened kingston valves. Others—notably in Europe—simply put out to sea and ceased to exist. A British battleship of the largest class vanished in calm weather without a trace—presumably scuttled by trogs who appeared among her crew. Ore hoists in mines ceased to work. The oil fields of East Texas burned for three months straight.

Radio transmission seemed rarely affected, and few newspapers seemed to suffer. But in what was convincingly a subconscious mass hatred of the civilization that men had built up, men seemed to go out of their minds and smash the essential, the key, the cornerstone elements of everything which held man above barbarism. No single individual possessed by troglodytic frenzy had ever been seen in the act of destruction, and no single individual had ever admitted mem-

ory of the commission of a troglodytic act. It was the twilight of humanity.

In four years, the industrial areas of the world had been depopulated, its peoples decimated by famines and plagues resulting from breakdown of all transportation systems, including the air, and the world seemed plunging into a new Dark Ages. But this new one would have no such hope as the first. In this new dark age men would tremble at the thought of any renewed rise, any second renaissance, because of the end of the last. And already, all over the world, the foundries and factories and machine tools of men lay idle and useless and rusting. The mass mind of man, it was clear, was tired of civilization.

Merely to know all this was bad enough. But to see New York dead and to hear its ghastly silence was worse. Dick sat sunk in absolute stillness for twenty minutes. Hamilton seemed sunk in apathy. And Sally said thoughtfully, with somehow the effect of one coming out of a reverie:

"The thing I've never understood is that no one has ever seen a real trog at work. If you smashed the control panel, Mr. Hamilton, you didn't notice any time lapse, but it must have taken some time. You went in, and it wasn't smashed, and then it was. Then you went out and said you'd just discovered it broken up. But didn't anyone notice you'd been in there for some time? Didn't anybody else hear the crashes?"

Hamilton looked up. His expression was suddenly surprised. Then bewildered.

"Why—no!" he said blankly. "And there were men in the next room! They should have heard the noise! But they didn't! That was why nobody suspected me of doing it! Because they should have heard? What the—"

He looked bewilderedly from one to the other. Dick nodded.

"Nice, Sally!" he said approvingly. "Your father guessed at something like that. Here's a perfect case. If Hamilton is a trog, he's no mere simple psychopath! He's at least a hypnotist and possibly a magician to boot. A smart entity, this mass consciousness!"

A man came out of one of the big hangars, carrying a long pole with a flag on it. He trudged stolidly out into the very center of the field.

"What's that?" asked Dick.

"He'll flag the plane in," said Hamilton. "Like they do on liners off port—or did when liners ran." He reverted to his own affair. "But what do you think hap—"

"This will be the London plane coming in?" asked Dick.

"Yes. Only one a day, now, and sometimes not that. Professor Sears will be on it. He sent you a message—"

"Radioed. Of course," said Dick. "That's why we're here. He's Sally's father. Been over at a parapsychological conference somewhere in the Pyrenees. The best brains

were invited to confer. Sears is the brains of our lab, and it's one of the few that work on parapsychology alone, which will solve the frog problem if anything will. But it's done little so far. Sears got transportation because of that, and transportation's hard to get. You saw how we crossed the Hudson! He radioed me to meet him. Something important and very urgent. I don't know what it was. And Sally insisted on coming, too. Risky, but she would do it."

There was an infinitesimal muttering noise to the northeast. It ceased and came again, a bit louder. The stolidly marching man was very near the middle of the field. He halted and swept the flag about him to unfurl it. He made signals with it to an empty sky.

"They're using an infrared telescope," said Hamilton, abstractedly. "Stepped up. They can see him. Look here, I don't understand—"

The muttering came on swiftly. It became a roar. A plane appeared well above the horizon, seeming to melt into view in midair. It came on and increased enormously in size. It was huge. It was gigantic. They were the biggest things on wings, those transatlantic planes. It stretched four hundred feet from wing tip to wing tip, and its body was the size of a small ocean liner. It came roaring it, and the wheels went down, and it dipped down to make the run that the really giant planes always made on landing, because it was uneconomical to land them on their jets since airplane fuel was so scarce.

The minute figure in the center of the field made gestures with his flag. The huge plane slanted down, looking like a monstrous, abstracted insect. It passed sixty feet over the flagman's head. Its jets should cut off now.

They didn't. The tail didn't swing down with a minor sputtering of auxiliary jets. The plane didn't level out and land like thistledown.

It hit. Hard. Still tilted forward and its jets still on. Its wheel stilts folded crazily. Its body hit the ground. It split open lengthwise. Flames spouted horribly from what would have been the head. Nobody came out of the wreckage. Nobody. The man with the flag began to run absurdly toward it.

II.

An hour after the crash, Dick hunted up Hamilton again. Hamilton's face was gray. Dick's own expression was very curiously set.

"Well?" said Hamilton drearily. "If I hadn't smashed the control panel, the plane could have come in all right. So I'm responsible for the wreck today."

"Yes?" said Dick. His nostrils flared a little. "I'm mad, Hamilton. I'm mad all the way through! Sally's knocked out by her father's death. It bothers me, too. I liked him. So I went to hunt up that man who flagged in the plane. I wanted to ask him if he noticed anything odd. D'you know what I found?"

Hamilton shook his head without interest.

"He was dead," said Dick, his voice shaking a little with rage. "A bullet through his head and his own pistol beside him."

Hamilton said drearily:

"I've been thinking that that's the best thing for me to do. I'm awfully tired. I'll give you that car of mine. It'll probably be useful. It ought to run for several years yet, and you can use anything in the way of fuel."

"Wait a minute!" said Dick savagely. "I made a couple of tests. That flagman's been dead two hours. Two! That means something, doesn't it?"

Hamilton looked at him vaguely.

"Two hours . . . two— No, Dick. The crash was only an hour ago. You must be mistaken, we saw him go out and flag the ship in!"

"I just had an Army doctor check it," said Dick. "The man who should have flagged the ship in was dead an hour before she was due. But somebody flagged her in! And the flag was put back by the dead man just exactly as if he'd killed himself after the wreck. Who flagged in the plane? Why didn't he report the suicide—if it was suicide? Why did he take over the dead man's job? Did . . . Something decide the plane was to be wrecked and find the right man uncontrollable. So the . . . Something had another man kill him and wreck the plane? If so—how? He was on the ground! The plane came in on manual controls! Could he make the pilot crash, as you imply you once made some people deaf?"

Hamilton looked absolutely blank. Dick paced up and down the room, his jaw set grimly. Hamilton shook his head helplessly.

"You're going to come up to our lab, so we can check you over," said Dick, firmly. "It's important. We start out with you just before dark. I've been talking to the Army. This is a curious business. I'm going to start all fresh. The mass consciousness of the human race is fed up with being civilized, we say. But my consciousness isn't. I don't know anybody whose consciousness is fed up. I don't know anybody who knows anybody who knows anybody who is awarely fed up. We seem to be deliberately committing suicide, while fighting to keep from committing suicide. The official answer is that there's a racial psychosis, a hidden mass madness—like your smashing the control panel. But nobody heard you do it! Why? It doesn't make sense. Nothing makes sense. But if I can really get the facts on an actual trog—and that's never been done yet—"

He beat his fists together angrily. Hamilton said helplessly:

"I don't see—"

"Neither do I. But only yester-

day the Army cleared a lane so you can get across the George Washington Bridge if you drive carefully. We start out in your car, you and Sally and I, and we'll find out something! I know you've got an official job here, but I'll wangle an Army request for you to come up to the lab."

Hamilton said with a wistful patience:

"Forget the job part, Dick. But I'm awfully tired. Not of being civilized, but of fighting to keep on being civilized, and then finding that I'm unconsciously a traitor to what I'm fighting for. I smashed that plane, ultimately, and I probably smashed transatlantic flying when I battered up the control panel. And I . . . I don't like it, Dick! I'm tired!"

"But I need you!" insisted Dick. "You let me fix things up and make a real test. A parapsychology test I'm figuring out now. Then shoot yourself if you like, afterward. There's one thing worse than being a trog. It's being a quitter. You'll do it?"

Hamilton shrugged.

"All right. But I'm . . . well . . . hopeless."

"Who isn't?" demanded Dick angrily. "See you later. I'll be busy until sundown. Then we start."

Dick went away. He went to the pathetic remnant of equipment which was the Army communications system for one whole section of the Atlantic Coast, which was moreover charged with maintaining communication with Europe. The Army was no longer a military force, but it was almost everything else, including a police force for areas in which there was no law but force. The ending of the Second World War had ended huge standing armies, but it had not ended without leaving plenty of Army-trained men behind. Veterans of the last war regarded soldiers, in the current state of things, as in some sense comrades. One would take no lip from them, but knew that they were acting under orders which would ultimately make sense. Therefore a single platoon or even a squad of soldiers, landed by air anywhere that trouble started, almost automatically became a company or even a battalion, if necessary, as war-trained men accepted its leadership and discipline. In any case, there could be no normal law-enforcement save in the very smallest cities. The Army, and only the Army, had jurisdiction everywhere.

There wasn't any Navy any more. Some of it was sunk. Much of it had been blown to bits by trogs presumably among its crews. But a great deal of it was aground or on rocks, where it stayed because there were no longer any repair facilities or means of salvage on a large scale.

The same state of affairs existed abroad. South America was not in as bad a state as the rest of the world, because it had not been so far advanced technologically. Central Africa was almost as it had been, save that the Victoria Nyanza power station was out and the Nile

Barrage was wreckage. But Czechoslovakia was a ghastly shambles of nonfunctioning factories and useless mines. Sweden was prostrate. Rebuilt Norway was in bad condition. Germany was in fair shape, because its factories had been ripped out by the victors of World War II. There was not much left to destroy in the way of industry, in Germany. It had gone in for hydroponics in a big way, to provide food for its population. Its rulers were effusively and abjectly anxious to convince the rest of the world that it was permanently repentent, but its people were sullen and bitter. Germans no longer traveled, and Germany had become almost a hermit nation. But its forced deindustrialization had saved it much trouble now.

Russia, too, was not too bad off, save that all its industries were stopped dead. But all industry in the world was stopped. Japan was starving. China alone among great powers was hardly vulnerable to troglodytism. Its civilization was ancient and created by its own people. The ten years of industrial development following the military collapse of Japan were wiped out—or paralyzed—to be sure, but China had gone back only ten or fifteen years, while America seemed doomed to retrogress a century or more, and England could not possibly feed its population and seemed fated to slide down the ladder of civilization for three centuries, and to a population hardly a quarter of its industry-supported number.

But while the human race slid backward in exact proportion to its progress, the world's factories and mines and power installations stood ninety-nine point nine-nine percent intact but utterly useless. Individuals acting under some compulsion which was sick of civilization had smashed the concentrated tiny remaining fraction which had made civilization possible.

At sundown Dick Drummond found Hamilton waiting drearily in his car. There were three soldiers with Dick, carrying bulky parcels. Sally was with him too, very pale, but calm and tearless. The soldiers silently loaded their parcels in the car. Sally got in.

"Let's go," said Dick.

The car moved silently away. It swung out of the airport and a little later down into the Grand Central Drive. It came out at the now-old Triboro Bridge. There were two great piles of wreckage on the bridge, where it seemed that trogs had gone mad and smashed their own cars into others at just the moment to cause a horrible piling up of others still. There were many such piles of wreckage near the great abandoned cities. Most of them had formed themselves during the evacuations, when hordes of cars poured out all at once. So some of the pile-ups were normal accidents. But some were certainly not.

The car reached the end of the bridge, where toll booths no longer were occupied. Dick said suddenly:

"The plan's been changed, Hamilton. Turn north here. You prom-

ised to help. You can. Just obey orders and don't ask questions."

Hamilton shrugged and turned north. Dick relaxed. After a little he said, "Turn left." Later still he gave other directions.

The car came to a halt in abysmal darkness. It was on a street, and there were looted, abandoned buildings on the right. To the left there was an open space which was actually Morningside Park. It gave off the smell of green growing stuff. But nothing could be seen. There were no street lights in New York. It was now a vast jungle of stones and silence, abandoned and desolate but not yet brought down by time. Dick got out of the car and flashed a flashlight skyward in short and long flashes. He repeated the signal and waited.

A cold, cold wind blew from overhead. Dick turned on the light again. The wind grew stronger, and then seemed to move. A helicopter came down out of the blackness overhead to rest on the pavement ten yards away.

"All right," said Dick quietly. He began to shift the parcels from the back of the car. When he had finished he said gently: "I'm sorry, Hamilton, but I've given up making sense, and this is part of the test. You go on up to the lab. It will be empty, but you know where it is. You wait inside it, out of sight, until I come for you. I'm giving you plenty of time. I'll be there by noon tomorrow or earlier. Don't ask questions now, but I've told the Army about this test and they want it made. Will you do it?"

Hamilton shrugged tiredly and then nodded. It was not pleasant for a man to believe himself a frog. Sally got into the helicopter. Dick loaded in the parcels and stepped within. The whirring sound began again and the helicopter rose swiftly into darkness.

It went up and up, and the city was black below it. No roof reflected starlight. The cañon-like streets absorbed all light. As the softly humming flying machine mounted toward the sky, the city appeared so much blacker than the rivers on either side that it gave the sensation of a monstrous, bottomless chasm beneath the helicopter.

But it drifted behind. The flier rose to five thousand feet and headed west. The earth was utterly unlighted. There were a few inhabitants on the west bank of the Hudson, and more where Newark lay abandoned by all save such resolute scavengers, but no light showed anywhere. It was not until the plane had passed quite beyond the metropolitan area that there was space enough for humans to live by agriculture. A very few lights showed in what had been relatively the wilds.

All during the flight, Sally was very quiet. The helicopter had a crew of two, and Dick talked with them for a time. They were not especially imaginative. They obeyed orders, and they had been told to pick Dick and Sally up, take them home, and give them what help they could. Dick did not try to explain too much. He simply said that his laboratory had been working on the

trog problem, and there was a bare possibility that something might still be done.

One of the two said meditatively that he could hardly swallow that stuff about everybody being tired of civilization. He said there was surprisingly little looting when the cities were abandoned. The looting came later. And he told of an old man he'd found on a road, weeping bitterly beside a broken-down handcart. He'd tried to carry his most treasured possessions with him. And the possessions were books. Hundreds of them. He'd hardly taken any clothes or valuables, but he'd loaded on an impossible weight of books and there he was crying because he had to leave them after all.

The helicopter landed at the laboratory little more than an hour after taking off. Then Dick and Blaisdell worked all night long, the two fliers helping uncomprehendingly in what had to be done.

Before dawn came the laboratory was empty. Its contents were stored chaotically in a most improbable location, and Blaisdell and Dick were thoroughly tired. Then Sally appeared from nowhere with hot coffee for them and for the fliers, and a little later the helicopter took off and went spinning straight up as the first red glow appeared in the east.

Up and up and up it went, and suddenly it twinkled brightly in sunlight which would not reach the earth for some time to come. It sped away to eastward and was gone.

Dick and Sally and Blaisdell looked at each other in the gray twilight before sunrise, and filed back through the unlikely door of the laboratory's new location.

"I wonder," said Dick when they were inside, "if we'll see the sun set tonight? We're taking an awful chance, trying to trap a trog, what with the mass consciousness"—his tone was ironic—"and all. I wish there were some safe place for Sally to be sent to."

"There isn't," said Sally quietly, "and I wish you'd tell me what you're going to do."

"I raised hell today," said Dick. "And the mass consciousness that's supposed to make trogs won't like it. And you and I started out with Hamilton. Since trog-stuff has been done at the airport, I suspect the mass consciousness knows about it. So if anybody has been delegated to be a trog and stop Hamilton so I can be asked why I ask such questions, will be upset when it's found that I'm not with him. So I suspect the . . . er . . . mass consciousness will let Hamilton go and trail him."

"What hell did you raise?" asked Blaisdell.

"I pointed out," said Dick, "that a man went out to flag in the plane that Sally's father was on, and it crashed. Then he went back to a hangar and shot himself two hours earlier. He was dead an hour before he went out to flag in the plane. So I asked why and how. Did the dead man resist becoming a trog, so he had to be killed and a trog sent out in his place? If so,

how did the trog crash the plane, he being on the ground? And then I pointed out that Hamilton was in the control tower a couple of days ago when the control panel was smashed with blows of a metal chair right before his eyes, and neither he nor half a dozen clerks in the next room heard a sound, though there must have been an ungodly racket. I had the Army query abroad to find out if such oddities had been noticed there. And then I had them ask for a voice-contact for me with some one—any one—of the other men who'd attended the parapsychological conference Sally's father had gone to."

"What happened?" Blaisdell rubbed his chin reflectively.

"Nothing," said Dick. "There were thirty-six men at the conference, and they were the best brains in the world on parapsychology. And, of course, that's the only hope, so far, of solving the trog problem. I suspect that some one or more of the thirty-six had some interesting things to say about trogs. Sally's father, for instance, pointed out to us a long time ago that trogs seem not only to go mad themselves, but to be able to have some queer effect on those around them. So that conference was a pretty promising affair. But all the men who attended it are dead. In four days. Accidents on the way home from the conference."

Blaisdell started. Sally bit her lip, very white.

"Your question brought that out?" asked Blaisdell.

"Yes," said Dick. "I made a rough calculation of the odds against such a series of coincidences. It was approximately four and a half times ten to the eleventh. And then I had the Army call attention to those odds and ask for comments. Since the trog is an international problem—"

Blaisdell looked at Sally.

"I wish she were somewhere else!"

"So do I," admitted Dick. "Now you see the point in the rather insane preparations I've made. Don't you?"

Blaisdell leaned back in his chair.

"The theory of mass consciousness," he said jerkily, "is an attempt to account for a mass purpose . . . by individuals not in conscious contact. It began in an attempt to account for telepathy, and assumed a . . . reservoir of human consciousness which some people could tap without knowing how and . . . so know things they couldn't have learned in any normal way. When this trog business began, it was extended. It was suddenly assumed that the . . . mass consciousness of humanity was able also to be more than a . . . storehouse, a passive storehouse of largely useless information. It was assumed that the . . . mass consciousness could acquire a purpose and . . . impose that purpose on individuals."

Sally said with distaste, still very white.

"That's beastly! There's no dignity left to the individual if his mind can be invaded by something

blind and horrible like that! I'd rather believe in devils than in a stupid mass consciousness with a stupid rage against civilization. It sounds like the sort of race nonsense the Nazis pretended to believe."

"They did believe it," said Dick. Blaisdell went on in the same jerky fashion.

"So it's been assumed that trogs were . . . possessed by the mass consciousness and forced to do its will. And . . . Dick put on the air waves today some . . . interesting anomalies in that theory and then . . . he suggested that the mass consciousness manifests not only a purpose but a plan. In the . . . case of the men at the Pyrenees conference, a specific plan. How about notes of the conference, Dick? Did you find—"

"Missing," said Dick grimly. "In every single case. There's nobody alive to tell what the best brains in the world decided about trogs when they got together. And there's not a scrap of paper, either."

Blaisdell grinned on one side of his face. The other side remained quite sober.

"So you raised the question of . . . how remarkably this mass consciousness thinks like a . . . common criminal," he said with relish, . . . resenting prying into its nature, and killing the men who solve its operations. You'd think it would simply take over their brains and . . . stop them, wouldn't you? Oh, you've raised hell, Dick! You've raised hell!"

Sally looked from one to the other.

"You mean," she said evenly, "if the mass consciousness exists, it will set out to . . . kill Dick as it killed my father and . . . the others who gathered to co-operate in fighting it?"

"Something like that," said Dick. "If there is a mass consciousness, I've offended it mortally."

Sally went very pale.

"Well?"

"Interesting!" said Blaisdell, still grinning on one side of his face only. "Oh, interesting! You've carried the mass consciousness idea to its . . . logical conclusion, Dick. By assigning it a specific plan . . . of murder, as it happens . . . for which there's no other explanation, you've made it into a sort of deity which controls the destinies of men. You've raised hell! Because to . . . accept that theory is to abandon every trace of belief in . . . your own importance. You're just a . . . pawn for the mass consciousness. It doesn't matter what you do. There's no such thing as . . . decency. You're not an individual

at all. You're part of something bigger and stronger and subject to vast blind rages and lusts for destruction. It's magnificently logical. Beautiful!"

Sally said fiercely:

"I don't believe it! I won't! It means that . . . religion, for instance—"

"Of course it does!" said Blaisdell delightedly. "The theory is superlatively logical nonsense! So nobody will believe it, and that will . . . produce skepticism, and that will produce all sorts of things. If there were a mass consciousness it should have kept people from developing instincts which are revolted by the idea of mass consciousness. And if there isn't a mass consciousness, then trogs aren't people irresistibly forced to destroy . . . all that we and they cling to, but . . . people doing the rest of us dirt. And in that case the human race isn't . . . fed up with being civilized and decent. It isn't the twilight of the race. And Dick Drummond had better be killed, and killed fast, before he starts . . . further revelations!"

Blaisdell chuckled.

"So," said Dick, I think that Hamilton will get here, and that he'll be trailed. He'll go into the empty lab, waiting for me. I told him to. And if there's a mass consciousness one of the three of us should become a trog and kill the other two, but somehow it doesn't seem likely. I think somebody else will be a trog and follow Hamilton to kill him and at least me. But he'll want to be sure and kill me. If he doesn't see me, maybe he'll hide—"

Sally interjected swiftly:

"You forget! Nobody heard Hamilton smash the control panel, though there were men in the next room."

"I think," said Dick, "that when a trog is in action, the people around him sort of . . . blank out. That would account for Hamilton and for that plane crash, too. Your father guessed at something like it, Sally. It would account for no trog ever having been seen in action. It fits in beautifully with the mass consciousness theory and makes us seem so much more helpless. So I brought a couple of Army photographic recorders along, and they'll start recording if we either turn them on or blank out ourselves."

"And then?"

"Maybe we'll get a picture of a trog," said Dick. "Maybe an encephalogram of somebody blanked out by a trog's activity. I don't know what we'll get, if anything. I just know, Sally, that we've got a parapsychological laboratory here, and we think there's going to be a trog around. Since I've already annoyed the great and benevolent mass consciousness, we might as well see what it's like."

An alarm buzzer sounded sharply. It was connected to a warning system about the lab. Someone was moving about the building, outside. It had been installed when looter troubles were at their worst. Dick moved to the

eyepiece of a periscope and peered into it.

"Hamilton," he said softly. "The front of his car is a wreck! He ran into something." Dick watched. "He's stopping in front of the lab— He's getting out— He has a broken arm, it looks like. He smashed up on the way. And he looks like a man who's in the most completely towering rage I've ever seen. His eyes are blazing. He's practically a lunatic from fury. Now I wonder—"

He moved quickly to another eyepiece.

"Take the controls, Blaisdell! Get under the encephalograph helmet, Sall! Now if Blaisdell blanks out the recorders are bound to start." He was silent for seconds. "Hamilton's coming inside the lab. He looks surprised that it's empty and the apparatus gone, though I told him it would be. He's barging around, opening closets and things. Maybe he thinks I might have left a note for him. Perhaps I should have—"

Blaisdell held a grip switch in his left hand and rather absurdly turned the handle of a silly small device with the other. Sally seated herself in the encephalograph chair and let down the helmet over her head. The encephalograph, turned on, would make a recording of the brain waves which were characteristic for her. Dick, still staring in the eyepiece, strapped a little clock-like device to his wrist, swiftly drew to himself a longer strap and buckled it around his chest, and then hooked his foot into a chair and drew it to him. He sat down, resting his left hand on a metal knob but never ceasing to watch.

He had a complete view of the interior of the laboratory. Where he and Sally and Blaisdell waited there was no daylight, only artificial light. This was a hiding-place prepared when looters were an ever-present menace. He could see the laboratory, though. He saw Hamilton sit grimly down on an abandoned box, with his back against the wall. Hamilton was full of a terrible cold rage.

Nothing happened. Nothing. Nothing. Blaisdell held a little grip switch in his left hand. If his fingers relaxed, it would close a circuit. It had been used in the laboratory to determine the exact instant a subject fell asleep under the influence of various somnolent or hypnotic influences. His right hand kept a small handle in constant, slow motion. It was geared to a tiny governor—a shaft with two metal balls held out from it by centrifugal force. Should Blaisdell let it stop, the balls would close a circuit.

If either of these switches closed a circuit, the recording cameras would register every sight and sound in the laboratory and around it. The encephalograph would record Sally's brain wave for comparison with normal brain wave records already on file for her in every possible mood and mental state. The various bits of apparatus on Dick's wrist and chest and under his palm would make a record of his respiration, pulse,

body temperature and innumerable minor details of his physical and perhaps emotional state. But all this would only happen if a trog should appear to murder Hamilton and especially Dick.

It was very tedious. Time passed and passed. The shifted laboratory was very still. Dick peered into one eyepiece and then another. Sally lay back in the encephalograph chair with the clumsy helmet over her head. She was very pale and very weary. Her father had been killed only the day before, and she had had no sleep. But she watched Dick steadily. Her face was sad and oddly wistful. Blaisdell turned and turned and turned the handle of the centrifugal switch.

His hand stopped suddenly. He was motionless. Completely motionless. Dick looked into the eyepiece of a periscope. He did not move a muscle. Sally remained perfectly still. There was utter silence. Utter stillness.

The silence and the stillness continued. The three in the underground room were more than motionless. They were rigid. They did not even blink. They did not look like living people, but like waxworks or something equally inanimate.

The warning buzzer sounded sharply. Someone or something else was approaching the building.

III.

All over the world, men fought the paralyzing influence, which after destroying industry had now set to work upon hope. Many millions of human beings had died, and all human beings had lost such artificial distinctions as once marked off the rich from the poor. The United States was no longer an industrial nation. It was hardly a nation at all. It had become a vast, an enormous expanse of agricultural hamlets. And all manner of primitive contrivances appeared magically. With all city populations forced out to the smaller towns and open country, there was no shelter for them or material with which to build shelters. Sod houses were revived. Americans adjusted themselves doggedly to conditions they fiercely resented. And an astonishing amount of civilization survived. Sanitation, in particular, did not go back to zero with the reversion of former apartment dwellers to sod huts. There were always some people who grimly insisted upon reasonable care for the prevention of disease, because there were so few facilities for curing it.

There were other things which also indicated that humanity was not reconciled to the abandonment of civilization. The radio chains still operated—not with the same elaboration of program, to be sure, but still covering the nation with a network of news. And newspapers thrived curiously. Not as giant organizations subsisting on advertising, to be sure. But country presses toiled unceasingly, and where they could not handle the burden, small duplicating machines

from abandoned offices published small sheets of strictly local and strictly practical data on the rear-guard action against barbarism. The United States might retrogress, because of trogs, but it would not go back one inch farther than it had to. And there was a surprising failure of any attempt by men who had left the cities to start to tear them down for material to use elsewhere. It seemed as if Americans doggedly insisted upon regarding the retreat to barbarism as a temporary measure only.

In other parts of the world much the same tendencies appeared. There was a resolute and it seemed pathetic confidence that somehow the sciences which had made civilization possible would ultimately furnish a path of return. And the mass consciousness theory was listened to everywhere and then dismissed with due respect but without acceptance, because it did not fit in with what people were willing to believe.

But the battle against the trogs was actually at its height in a low-ceilinged, windowless room where Dick Drummond, and Sally, and Blaisdell sat motionless with fixed and staring eyes amid a maze of hastily shifted laboratory apparatus.

A red light suddenly glowed before Blaisdell. His hand had resumed its monotonous turning of the small centrifugal switch. Dick shifted his head to look through the eyepiece at a slightly different angle. Sally moistened her lips.

Then Blaisdell said sharply:

"The light's on!"

It went on because the centrifugal switch, having once closed a circuit, had broken it again. It told him that he had stopped his cranking, whether he was aware of it or not. He stopped a second time. He glanced at indicators. He shut off separate self-registering apparatus. And Sally looked startedly at the amplifying bank of the encephalograph. Its tubes were all lighted, and there was a long, long strip of tape with neatly inscribed wave forms which, except at their very end, were not the usual form for her particular brain at all.

"What happened, Dick?" asked Blaisdell. "It looks like we blanked out, all right."

"Nothing happened," said Dick evenly. "Hamilton's still sitting where he was. Oh, yes! He's shaking his hand and swearing. He was holding a cigarette. And . . . we must have had a trog around! Hamilton blanked out as we did, and the cigarette burned up to his hand and scorched him."

He went to all the other periscopes in turn.

"There's a motorcycle leaning against Hamilton's car. Quite an ordinary one. What the devil?" He went the round of the eyepieces again and said restlessly, "Nothing else. But we were unconscious. All of us. And we had no sensation of time lapse. Not a trace. Let's see what the trog did. We know there was one around."

Blaisdell pulled on a little cord and the recorders delivered themselves from their chutes without

any sound whatever.

"Hm-m-m. They were on for ten minutes and a half," said Dick. "He didn't waste much time. Apparently he didn't do anything at all. But somehow I don't trust the alleged mass consciousness to be so considerate. Not after what it's done."

He pulled out the strip of recorded film. It was Enright film, which, of course, is insensitive to light except in its own special electric field, and is developed by the light which falls on it in that field. He fed the end into a tiny projector. He pressed the button. The miniature screen lighted up and showed the inside of the emptied laboratory. There was no sound whatever. Hamilton sat at one side of the field of the camera, sitting rigidly with a thin thread of smoke rising from a cigarette in his fingers. Nothing happened for a minute or more. Then the projector reproduced faithfully the sound of footsteps. An instant later a tiny figure walked onto the screen, and there were sudden, quick, indrawn breaths from all three of those who watched. Because the figure was utterly commonplace. It was a perfectly ordinary man, dressed in perfectly ordinary clothes. He stared around the empty laboratory and scowled. He glanced at Hamilton and thereafter ignored him.

For six or seven of the ten and a half minutes of record film the man whose mere coming had made four others unconscious simply searched irritably for some reason for Hamilton driving so far from New York merely to sit on a box in a room from which apparatus of some sort had been recently removed. He looked in Hamilton's pockets for a note or memorandum, and found nothing. He stood still a moment, frowning in thought.

Then he looked up, walked across the room, and opened a closet door. He examined the interior, walked in, and pulled the door shut after him. After a brief interval, Hamilton stirred suddenly and stared down at his scorched fingers. He swore, and the sound of his swearing was dispassionately repeated by the record film.

Then the projector stopped. There was a moment's silence.

"He's a—man, and he's in that closet," said Sally quietly. "Do you know, I'd thought maybe he was a Martian or something unhuman, because nobody'd ever seen one?"

"Yes," said Dick. He gnawed at a finger end. "He figured out that Hamilton was waiting for someone. Me, most likely. So he went in the closet. And he's there now. A trog, not trogging."

He looked at the others. Blaisdell rubbed his chin.

"If he gets tired of waiting, he'll come out and—it may be bad," said Blaisdell jerkily.

"That's my thought," said Dick wryly. "It's nasty, isn't it? I'm going to kill him."

"Technically it will be murder," said Blaisdell, "but I . . . was going to suggest doing . . . it myself. We've got to find out how he . . . does what he does, even if he . . . didn't do anything in particular here."

Dick opened one of the parcels he had brought on the helicopter. He was very pale. He brought out a small, short, and very unpleasant weapon.

"One thing," he said, and licked his lips, "we know he's alone. The motorcycle, for one thing, and if he'd had another trog with him he'd have gone out or called to say he was going to hide to wait for something to happen." He moved toward a door." "Listen," he said, dry-throated. "I'd feel a lot better if he had three legs, six arms, and a pair of purple feelers with eyes on the end. You wouldn't mind killing something like that. But . . . if I don't get him he'll kill Hamilton anyhow, and maybe you two. And his kind has smashed up everything we humans have been trying to build for a good many thousand years. So . . . I'm not going to be squeamish."

He went out. Sally shivered a little. The little color she'd had, now drained away. Blaisdell moved awkwardly.

"It's justified, Sally," he said jerkily.

"I'm just afraid," said Sally through stiff lips, "that Dick will get hurt."

There was dead silence. After a moment Blaisdell moved and looked through the eyepiece of a periscope.

"He hasn't stirred." He moved and peered out of another. "Dick's outside in the sunlight. He's sneaking around to the door. One lucky break, that trog in the closet can't see anything. He'll be listening, not watching."

There was silence. Blaisdell went back to the first periscope, which commanded the interior of the lab. These periscopes had originally been built in as part of the psychological apparatus, so that the subject of an experiment could be watched without being aware of the fact. Blaisdell watched, and watched. Nothing happened. His hands were clenched so tightly that the knuckles showed white.

There was a sudden muted sound which came through even to the soundproofed room to which the laboratory apparatus had been shifted. Blaisdell, at the periscope, seemed to tremble at what he saw.

"He . . . blasted the door," he said with difficulty. The jerkiness of his speech enhanced enormously with excitement.

The short, muted, infinitely savage sound came once more.

"Dick did it again. The . . . trog's bound to . . . be dead now, Sally. Hamilton's jumped up. Dick's in there . . . with the tommy-gun . . . still pointing at the . . . closet door. He's . . . opened it—"

Blaisdell swallowed.

"The trog's . . . dead all right, Dick's searching him quickly. He looks sick. He's got all the stuff out of his pockets. He's got something with wires dangling from it. He and Hamilton are getting out—"

Blaisdell straightened up. His face, or one side of it, worked nervously. Sally caught her breath.

Two minutes later Dick and Hamilton came into the room. Hamilton looked like a ghost. As he came in, he was saying:

". . . Nothing ever startled me like that in my life! He wasn't in that closet! He wasn't! I looked —What the devil's this?"

"I told you we'd moved the lab," said Dick unsteadily. "We did. Downstairs. Last place anybody would ever expect to find it. And we were fitted up to do behaviorist observations from down here on subjects up above, and when the looters were bad we camouflaged the way down to make this cellar into a hiding-place. It was even soundproof. So—"

Sally touched him with a shaking hand. She pressed her cheek against his shoulder and then turned away blindly.

Dick was suddenly silent. Blaisdell winced. Then he said jerkily: "You feel queer, Hamilton? How was your trip? How'd you smash your car?"

"Smashed my car and broke my arm in a trog-contrived smash-up," said Hamilton savagely. "And I've got something to tell you—"

Sally was not in the room any more. Dick had suddenly gone out, after her. Blaisdell's face twitched, but he ignored Hamilton's announced news and talked volubly, for him, and showed Hamilton the recorder film of what had taken place in the laboratory overhead. It was the motion picture which showed that while Hamilton and the other three were blanked out a man had gone into the emptied lab, searched it angrily, and then hidden in the closet to wait for whoever would meet Hamilton.

"And he was trog," finished Blaisdell. He grinned nervously. "He had to be. So Dick went out and—shot him."

The door opened and Dick and Sally came back. Dick's pallor had vanished remarkably. His nervousness was gone. But Sally was alternately very pale and flushed.

"Blaisdell," said Dick eagerly, "Sally and I—"

"Please!" said Sally imploringly. "Please, Dick!"

Dick stopped short. Blaisdell was silent. Dick fumbled for words and then said awkwardly:

"I see you showed him the record. Have you looked at the other data yet?"

Blaisdell shook his head. Hamilton put his sound hand to his other arm and said painfully:

"There's plenty of excitement around here, but I've got a broken arm and it's swelling. Can anything be done about it? And I've something to tell you—"

"I can set it," said Sally quickly, "if it isn't splintered. I can make

you more comfortable, anyhow."

"Fine! I'll come back in a minute and thrash things out," said Hamilton.

He followed Sally out of the room. Dick said uncomfortably:

"Blaisdell, old man—"

"Forget it!" said Blaisdell jerkily. "I know! I saw it coming. And . . . you've seen my brain-wave form. I wouldn't . . . ask her to marry me anyway . . . with that. So it's all right. Forget it!"

Dick hesitated. Blaisdell sweated. Then Dick said humbly:

"Thanks." In a changed tone he added, "Let's look at the curves we made while we were blanked out. I got something from that trog—it was strapped to his skin—that may be the answer. And it scares me to death!"

Blaisdell silently clipped off the tape which carried the encephalograph record of Sally's brain waves while she was blanked out by the presence of the trog above. The last few curves, made after they had returned to consciousness and before the instrument was turned off, were a perfectly normal pattern. Sally's waking brain-wave graph was smoothly curved and beautifully regular, with precise peaks and exact troughs. It was the pattern made by a sound, good brain not quite exactly like any other. But as Blaisdell slid the tape to look at the wave form during the blanked-out period, his eyes widened. He held it out wordlessly to Dick.

"Lord!" said Dick. "Sally didn't make those, did she? Why . . . this wave form's another one—"

Blaisdell went across the room. He pushed stray objects aside and pulled out a file drawer. He plucked out a record and brought it back.

"Looks like this one," he said briefly.

Dick tapped his fingers, frowning. He reread the case history on the back of the record.

"Chap in a trance state," he said. "His doctors didn't know whether it was epilepsy or catalepsy or what. But it was a border-state, not either one. We called it narcolepsy. Sleep-seizure, you might say. He'd go into a sort of trance. Unconscious, but not rigid. His muscles weren't tense unless you tried to change his position. Then he'd resist. But the mental state was like that of an old man's dozing, from which he woke and insisted that he hadn't been asleep or unconscious at all. D'you suppose that was what we had?"

"It fits," said Blaisdell. "Surely. Like a doze, so light that we didn't know we'd blanked out. Probably no violent changes in . . . pulse or respiration to be adjusted on waking. That's why we didn't know we'd blanked out! It fits."

Dick went to the pulse record and respiration curves he'd made of himself. They were almost completely normal, except for their unnatural regularity. While the trog had moved about, overhead, he and Sally and Blaisdell and Hamilton had been in a trance in which every physical function had been undis-

turbed, but with consciousness completely gone.

Dick put down the strips of paper tape and painstakingly laid out the objects he had taken from the dead man upstairs. An automatic pistol, a watch, a wallet in which every item was definitely American, a handkerchief, and just such items as might be found on any man who had not been robbed of them during the troubles after the evacuation of the cities. But there was one thing besides. That was a metal box or case with rounded edges, curved to fit the shape of a man's body. It was three inches by seven, and it had been held to the dead man's skin by adhesive tape. Thin wires came from it, to divide and subdivide almost endlessly. Most of the finer filaments were broken off by Dick's violence in removing it, but there were small tags of metal at the ends of three of them, and these also had plainly been held in contact with the dead man's body by tape. There were two round buttons on the curved top of the box. One was pressed in. The other protruded.

"This thing must have done the trick," said Dick grimly. "We've got to find out how. I admit it scares me."

Blaisdell put out his hand.

"I'm the man," he said fiercely, "who's going to open it! I didn't . . . protest when you went out with . . . the gun. But I want to do this!"

Dick grinned wryly.

"You'll use a recorder as you open it?"

"I will. And the . . . recorder will be shooting in a mirror from behind a . . . rock," said Blaisdell. "This box will be . . . under oil. And I'll be scared green. I'll go over by that . . . white rock in the pasture lot uphill."

Dick knew the place. Perfectly. It was a mile or more from the lab, and could be watched from it. He nodded. As the thing lay on the table before him, though, he thoughtfully turned a light on it and scanned it from every direction with a recorder camera, leaving a tiny slide rule alongside for scale. He pulled out the exposed record film and put it aside.

"It's all yours. Luck!"

Blaisdell put the oddly-shaped box almost carelessly in his pocket. He picked out what he wanted. Mirrors with adjustable stands. A recorder—for both pictures and sound, of course—a large can of oil, and an assortment of small clamps. He nodded and went shambling out of the door.

Dick looked almost ashamed. When the others found him he was outside the laboratory, staring at the white rock a long way off. Blaisdell seemed to be merely puttering around it.

"What's happening now?" demanded Hamilton.

"Blaisdell's opening the box that made us all blank out," said Dick harshly. "Somebody's got to do it. He insisted."

"But—why not?"

"Trogs are dirty," said Dick.

"They've smashed civilization. With those boxes, I suspect. And they wouldn't want us to know what is inside in case we got hold of one by accident. So I'm worried. Naturally! I'd rather have done it myself."

Blaisdell, a long distance away, lay down on the ground. Dick ceased to speak. He watched tensely. The others stared at the tiny, puppetlike figure far away. He seemed to be motionless for a long time. Then, suddenly, there was a sharp, actintic flash and a cloud of white smoke. A sharp report came seconds later.

Dick continued to look strainedly at the distant place. Blaisdell got up, picked up his bits of apparatus, and came awkwardly back toward the laboratory.

"He didn't get hurt!" said Dick. "Thank God for that!"

"That flash—"

"That was the gadget, the case that distinguishes a trog physically from other men. It blew up. We were afraid it would. Even a trog might get killed by accident, and if somebody found a thing like that on him and opened it, he might—he just possibly might—discover what it could do. So they'd arrange that when one of them was opened by somebody who didn't know how, it would explode. We should have hunted up a specialist, I suppose."

"'They' arranged it?" said Hamilton angrily. "Who are 'They'?"

"The real trogs. The real, master troglodytic minds. We've been using the term loosely. I mean the real cavemen who really don't like civilization. Who resent civilization. Who don't want it—and won't have it!"

He went to meet Blaisdell. The two of them came back to the laboratory, talking earnestly. Dick had half the apparatus and Blaisdell explained in a labored fashion. They dived underground—and Hamilton looked up and realized that a dead man lay on the floor of the upstairs, emptied laboratory, his chest practically pulped by machine-gun bullets.

When Sally and Hamilton went down, the recorder projector had just stopped and was rewinding its film. Dick pushed the button again as it stopped re-reeling, and it projected once more just what it had shown before. Dick and Blaisdell watched absorbedly. For an instant the picture was confusing. The two new watchers were unable to see anything clearly until they realized that the recorder had been photographing a reflection in a mirror from behind a protecting mass of stone.

Blaisdell's hands showed on the screen. The curved, rounded box appeared. It fitted in a clamp under a wavering surface which was obviously oil. Blaisdell worked a screwdriver. A screw came out. He worked it again. Another. There was a long pause. Then two clamps reached in, took the loosened halves in charge, and flipped over the upper part. For the fraction of a second the interior of the box was visible, but only for the

fraction of a second. Then there was a flash of light and a billowing explosion which smashed the mirror and would have smashed the camera had it been shooting directly.

The film stopped. Dick ran it carefully by hand in reverse. Three frames showed the interior of the box. Blaisdell set copy sheets against the screen, exposed half a dozen on each of the three frames, and fixed them by heat. He and Dick settled down to a careful study of the still photographs. There had been a delay of perhaps a tenth of a second between the time the box cover was removed, and the time its contents were masked by the explosion flame which destroyed them. The recorder had gotten three pictures in that interval, showing a maze of small metal parts in close-packed arrangement.

"It's going to be a job," said Dick meditatively, "but you can see what they've got. This is a battery. Here's an oscillator. It looks like this is a Krumpf-Howd inductance. And they may have figured in their capacity as between leads, but we can't see but so much. A nice job of design . . . at first glance, anyhow. It's an electronic circuit. But what do you suppose it does?"

Hamilton said abruptly:

"Before you lose yourself in that, I told you I'd something to tell you. You've killed a trog and you've found out the devil of a lot. But I've talked to one!"

Dick jerked his head up. Then he swung around in his chair. Blaisdell turned to listen. Sally's eyes opened wide.

"Pour it out," said Dick. "You—" He remembered. 'Oh-h-h! On the way up, eh? You looked very angry when you went in the lab upstairs."

"And on the way up," said Blaisdell jerkily. "You . . . broke your arm. We didn't ask how. How?"

"You left me, Dick," said Hamilton savagely, "with instructions to come on up to the lab. You said it would be empty and for me to wait inside—and to look out for trouble. I was pretty desperately unhappy when you left. I thought I was a trog and the best thing for me to do was to commit suicide. I almost went back to the airport to do it. But I came on. I got to the George Washington Bridge. It's the only way to get a car across the Hudson since the tubes are all flooded. I started across it. There was a narrow lane through the wreckage of other cars. In the middle it was fairly clear. I went up to thirty or thirty-five miles an hour. The road was clear as far as the headlight rays went. And then all of a sudden I wasn't in my car. I wasn't moving. I was in darkness.

There were weights pressing me down. I hurt, horribly. I was one huge agony. Wind moaned somewhere. I couldn't see anything and I couldn't move. And then a voice said, 'Where are the others?' The pain got worse. The voice repeated, 'Where are the others? There was a man and woman with you. Where are they?' I didn't answer. I was startled and dazed and in agony. Then the pain got worse and the voice repeated the question and it got worse each time. I realized that it would keep on getting worse until I answered. So I panted that you'd gone away in a helicopter, leaving me to follow. Then the voice asked, 'Where did they go?' And the pain was so horrible that I fainted. When I came to, I'd been pulled out of the wreckage, my car was ready to back out of a heap of other smashed cars, and I had a broken arm. There was wind moaning through the cables of the bridge. I . . . backed the car out and came on."

Dick said dryly:

"I hope you guessed that you were speaking to the mass consciousness of humanity in some strange, dim-lit cosmos between this world and the next. But it should have known where we went without asking you. It slipped up. What was the voice like?"

"Detached. Uninterested. Hardly even threatening," said Hamilton, raging. "It was going to torture me until I answered, and it didn't feel anything at all. As if I were a . . . worm or an insect it was finding something out from. Coming up here, with the clues you found at the airport, I put two and two together. You'd warned me to look out for trouble. It all fitted together. I guessed that you'd known what you were doing. So I came on up. But I was raging. Oh-h-h, I was mad! And I'm not any less mad now!"

Blaisdell grinned nervously.

"Not being unsympathetic," he said jerkily, "it's . . . almost funny! You lying there in the dark, with a trog—the trog Dick killed—trying to play at ghosts-and-devils with you."

"I'm going back," said Hamilton fiercely. "You give me copies of those photographs. You know your stuff. I know mine. Mine's engineering, and I know a trick or two. I'll be back sometime before dawn with at least a couple of those gadgets that trogs wear, and they'll be open, and you can play with them!"

"God forbid playing!" said Dick. "Better bring a couple of Army men—who aren't trogs, eh? I think we're going to have to work fast. But it looks like we've made a crack,"

Hamilton went out. A moment later he put his head back in.

"By the way," he said. "I'll take that motorcycle. Use it to get back with. Make better time. And it'll go in a rowboat. I'll find one somehow. I can make a raft if I have to cross the river. I'd rather not cross the bridge again."

He grinned unmirthfully and was gone.

"I hope they've a portable X ray

at the airport," said Sally thoughtfully. "That's the thing that will show up trogs. We just never happened to realize it before. Those things they have to wear will show up instantly on a fluorescent plate."

Dick turned and stared at her.

"Do you read people's minds?" he asked mildly. "If so, please read Hamilton's and tell me if he's going to be really careful. It wouldn't do a bit of good to catch a trog if he knew you'd caught him. He'd just push a button—"

IV.

Before noon of that same day, Dick went down to the village of East Kingston with a bundle of carbon-copy sheets in his hand. He looked very tired, but he came away marvelously satisfied. East Kingston was very small but very densely populated. Before the evacuation of the cities it had been a quiet if not somnolent village, deriving much of its prosperity from the fact that it was far enough from the metropolitan area to furnish an almost rural background, yet was within a five-minute drive of a helicopter field and with excellent commuting service to New York. It had a certain percentage of agricultural population, a possibly larger proportion of commuters with an interest in gardening, and a small machine shop, a radio television shop, a few general stores and a chain grocery, and the customary service places.

Since the evacuation of the cities, its population had more than quadrupled. But much of the increase consisted of relatives and friends of former inhabitants. It was still a surprisingly tight group of people with similar interests and resolutions. The siege it had endured from the looters had increased its homogeneity. Except in size, it was almost a city. Its people already had the beginning of a walled-town attitude toward the rest of the world.

But not altogether. They were a close knit defensive group, and they still remembered the rest of the world. Dick went into the town and to the headquarters of the organization which had been improvised to conduct the defense during the siege, and now held on grimly to all of civilization that could be held. There were three men in the headquarters, all working. Dick talked for ten minutes and handed over his bundle of typed and carbon sheets.

Within half an hour six boys and men had left the village. Two went by bicycle, vanishing into narrow paths through the woods. Two set off on foot. Two more took one of the town's few running cars and with rifles handy went swiftly away. Each carried copies of the sheets to other communities. When they had gone, Dick felt most of the tenseness leave him. Civilization would now come back.

The typed sheets were terse, specific statements of the essential facts that he and Blaisdell and Sally had worked out. That trogs were not otherwise innocent people, moved by the civilization-wearied

mass consciousness of the race. Trogs were men who were breaking down civilization with deliberate intent. They wore, next to their skin, small, rounded metal boxes three inches by seven, with fine wires radiating out to end at tiny metal tags also next to their skin. There were two buttons on those boxes. When one button was pushed down, the trog's body became either a radiator of high-frequency waves or the center of a field of force which made every other human being in a certain area become unconscious. This could be proved because—though people who had become unconscious woke so smoothly that they were conscious of no time lapse—it was possible to prove that time had passed of which they had no memory. If the boxes were opened, even under oil, they exploded with a violent flash of bright light which suggested that the mechanism inside was made of magnesium, to burn in the explosion flame. This information must be spread in every possible way. Amateurs in electricity could try induction balances to detect trogs—but if trogs had an instant's warning they could defend themselves. It was advised that if a man was suspected of being a trog that he should be knocked unconscious — not killed — and searched for the metal box which was a trog's essential protection. If such a box was found and removed, the trog would be helpless and could be questioned. He should be! The button on such a box should not be pressed, for obvious reasons. This information should be spread by every possible means.

Dick trudged back to the laboratory with weariness tugging at him. Six messengers had carried copies of that warning to other small communities. They would duplicate it and send it on, in turn. Presently some radio station would broadcast it—and maybe be destroyed immediately afterward. But that information could not now be suppressed. Slowly but surely it would travel over the whole area that had been the United States. And the United States was a nation of technically minded individuals. In its hundred and forty million people there were many millions indeed who would prefer to believe it. There were hundreds of thousands who would see a technical problem—the handling of the trogs—where before they had seen only the twilight of the race. And somebody would surely solve the problem.

There might be many people killed by trogs as they found out what had been revealed about them, but there would be many trogs killed, too! And there could never, never, never be any suppression of this knowledge if only it had a mere one or two days' start.

It was a good job, well done. Dick began to imagine the results. He'd set a trap for a trog. Other men could, too. One could set up a photocell circuit to fire a blast of machine-gun fire when a beam of light was broken—once it was realized that trogs were intruders, without supernal guidance in their de-

structiveness, and never normal individuals gone mad. One could arrange the flooding of a room with gas when a centrifugal switch made contact as its operator lapsed into unconsciousness. There were innumerable such devices which could be and would be contrived. And of course the actual working of the trog instrument would sooner or later be understood.

Dick felt definitely let down when he got back to the lab.

"Now, if they get us," he said, yawning, to Sally and Blaisdell, "they'll only be fooled. Because the news is out and their game's ultimately up. Given two days, please God, no amount of slaughter could keep it from spreading everywhere. I think we deserve well of our country."

Sally smiled faintly at him.

"But having gone so far . . . as we have," said Blaisdell jerkily, "we've still no official theory of . . . what it's all about."

Dick yawned again.

"I feel all in," he said tiredly. "It'd have been a mistake to try to generalize without a sufficient body of facts. Now we know that trogs mean to smash civilization, and they've gone about it in a clever way. Maybe—" he yawned a third time—"maybe they represent a conspiracy to seize this sorry scheme of things entire, and then to shatter it to bits, then to remold it nearer to their hearts' desire."

He sat down and lighted a cigarette. Sally quietly put an ashtray close at hand. Dick luxuriated in the feeling of relaxation. In thirty-some hours of tense alertness he'd absorbed the shock of seeing in reality the collapse of civilization which before had been only a narrative. He'd seen a close friend—Sally's father—killed before his eyes in the deliberately produced wreck of one of the few transatlantic planes remaining. He'd found evidence that the widely publicized explanation of the wreckage of all civilized life was a lie, and probably a deliberate one. And he'd laid a trap and it had worked and he'd actually killed a trog—which however smoothly it had happened was a hair-raising experience—and had handled a small box which probably contained the secret of the twilight of the race. And on top of that, now he'd done the one thing which would ultimately put at least the United States back on the way from barbarism.

Until the last instant the feeling of urgency had been extreme. Now he was tired out. The basement under the emptied laboratory was very quiet. The lights were not too bright. The chair was comfortable. He relaxed.

"But the question still persists," insisted Blaisdell. He sat in near-darkness on the other side of the room. "We know what the trogs do. They smash the . . . key stuff in our civilization and it can't . . . keep on. But why? What do they . . . gain by it?"

"I don't know," said Dick. "Sit near me, will you Sally? You don't talk much. It's so doggoned restful. You go ahead and talk,

though, Blaisdell. We've still got a lot to do. I'll be with you in a minute. But I want to let down a second or two. I'll be listening. I'll absorb. But I just can't do any more thinking for a while."

Sally sat on the floor, resting her back against his chair. He touched her shoulder lightly.

"What do they gain?" repeated Blaisdell jerkily from the darkness. "That's what I've been trying to work out! They're not working for themselves as . . . individuals. With the gadget they've got, they could have . . . looted incredibly. They could have stolen . . . all the money in the world. They could have done . . . anything. But instead they smash civilization! Why? If they'd been crooks they could have . . . all been millionaires! But this trog business hasn't been a . . . business of theft."

"No," agreed Dick. He closed his eyes so—he assured himself—he could listen better. "There was no epidemic of robberies before the trog business began. That wasn't it—"

"They're working for a . . . common purpose," said Blaisdell. "And it's not easy to think of a common purpose that would . . . make men pull down all of civilization. There needn't have been . . . so many of them, at that. A few hundred in all of America . . . able to destroy with impunity as they have, could do . . . very nearly all they've done. But it's . . . all over the world, too. Everywhere! There must be . . . thousands of them altogether. What are they working for? Why are they . . . destroying?"

Dick roused himself a little.

"They're trogs," he said drowsily. "They hate what the rest of us prefer. Decency and comfort and safety, and just being able to get along with other people—"

There was a pause. Then Blaisdell's voice changed a little. It sounded somehow startled.

"You said something then. Look at what they persuaded the rest of us to think! Mass consciousness. A sort of deity, only without benevolence . . . demanding everything and giving nothing, not even comfort . . . stripping every man of belief in his own importance . . . doesn't matter what you do, it's neither good nor bad . . . no good except what the mass consciousness of the human race commands . . . follow—instincts . . . no such thing as decency . . . part of . . . bigger than you are . . . you're a mote, an atom . . . can only submit—"

Dick heard no more. He was asleep in the comfortable chair. After a moment or two Sally said softly:

"*Sh-h-h-h!* He's tired out. He needs rest." Then she added conscientiously: "You do, too. Why don't you lie down and rest a while? I'm not a bit tired. I'll look out for things."

Blaisdell sat quite still for an instant. Then he got up with the effect of unjointing himself. He started to speak and stopped. Then he said very quietly:

"That's a very good idea, Sally."

He went out. Sally did not watch him go. She was looking at Dick. So she did not see that his face twitched mirthlessly as the light from outside touched it.

Dick woke again very gradually. There were fewer lights turned on. The room was underground and there was absolute quiet. And there was a warm pressure against him. He looked down. Sally sat on the floor, asleep. She had been leaning against his chair. As she slipped off into slumber, she had laid her head upon his knee. And she had a revolver in her lap, with her fingers all relaxed around its butt.

"My God!" said Dick humbly.

Sally waked as he kissed her gently.

"Little idiot!" said Dick gently. "I'm not altogether a child. I shouldn't have dozed off like that, but I didn't need to be watched over, certainly. And did you expect to defend me with that pistol if a trog came?"

She flushed and stammered. He kissed her again. But it was notable that she felt no great discomfort in having made herself ridiculous, since it seemed to have pleased him.

"I wonder what time it is?" asked Dick after a little. "And where's Blaisdell?"

They found him in an adjoining cubbyhole with waste paper crumpled in a pile beside him. He was red-eyed and worn out, and his face was whitened by strain. But he was triumphant.

"Look at that!" he said fiercely. "I worked both ends against the middle all the way, but look at that!"

Dick picked up the sheet before him and began to study the intricate circuit diagram. He frowned in concentration.

"There's an arc to make the oscillations," he said surprisedly, "and . . . what the devil—"

Blaisdell pulled it quickly away.

"Hold it. That's . . . not finished. That's a circuit I was working on. Here's the one of their gadget. Look, Dick! We knew what they were trying to do. They wanted to . . . affect brain waves. So just . . . make the guess that they do it directly instead of indirectly as it's . . . always been done before! I tried to . . . work out their layout from that angle. It gave a . . . clue at the beginning, a wave length to figure from . . . one-point sixty-seven centimeters. That'd be a resonance frequency for those Paulson neurone molecules, remember? The . . . ones in our brains that break down with mental activity and . . . reconstitute themselves with rest? See it?"

Dick started all over again on the second diagram. It was simpler than the first.

"Figure it out," said Blaisdell jerkily. "Normal breakdown of Paulson molecules . . . following a regular sequence . . . makes the energy for consciousness. Breaking down they . . . have a by-product of electricity which we pick up and amplify and call brain waves. We make encephalograph records of them. Normal waves have a . . . normal pattern. There are . . . pattern changes for sleep . . . mental effort, and so on. During mental effort there are more breakdowns . . . more energy used. See?"

"Part of it," said Dick, absorbedly. "There are two circuits here, though, linked together. This one on the right is standard radio-frequency and it's modulated by—"

"Coming to that," said Blaisdell, grinning crookedly. "The left-hand circuit generates one-point-sixty-seven waves, Paulson molecules absorb them and break down faster or slower as they're stronger or weaker. This dinkus is a modulator that makes 'em stronger or weaker in the pattern of those waves Sally recorded when she was blanked out by the trog upstairs. So when this generator is working, the Paulson molecules in our brains follow that pattern and we have those brain waves, and we blank out."

"Say it again," commanded Sally. "And slowly."

"This generates waves that control Paulson molecules in our brains. Paulson molecules make brain waves. So this circuit controls our brain waves, and therefore whether we're awake, asleep, alert, or—having fits."

"He means you can force an oscillator," said Dick, "and our brain is one. So you can make it do tricks. Pretty! But look here! Micro waves like that would blank out everybody all around! Everybody! Including the man who carried it!"

"Circuit on the right," said Blaisdell. "It's standard radio-frequency using the man's body to radiate it. High-frequency waves don't go into the middle of the antenna that's radiating them. There's a skin-effect and they all stay on the surface. But those waves wouldn't do anything. So they're modulated. In radio, you modulate a fifty-megacycle wave with two-kilocycle voice frequencies. Don't you? But suppose you modulated a . . . two-kilocycle wave with fifty-megacycle frequency? What sort of . . . wave would you have?"

"But it's imposs— Holy mudcats!" said Dick, awed. "You wouldn't get sine waves! You'd get corrugated ones! They look like a piece of spiral spring pulled out and bent into sine-wave form! There'd be all those little bends in them besides the sine-wave curve!"

"That's the point," said Blaisdell. He grinned crookedly. "The short stuff shot into a trog's body would go right in and blank him out. But short modulation of a normal high-frequency wave would

stay on his outside—and radiate. And it wouldn't be . . . microwave stuff until it hit us. Then—out!"

Dick sat down suddenly, as if his knees had given way beneath him. But his eyes were shining.

"And of course," he said joyously, "a wave form always tends to smooth out, so those corrugations wouldn't stay put! They'd all die out. So the range of the thing is limited. Very limited! Blaisdell, it's beautiful!"

Sally said:

"I wouldn't call it beautiful. Look what it's done!"

Dick looked at her blankly. Then he grinned.

"Blaisdell made a diagram of his own. Let's see what it is."

But Blaisdell crumpled the diagram and put it in his pocket.

"Let's let it go for a while," he said in sudden harshness. I don't want to think about that right now. It's bad stuff. I'd rather nobody ever thought of it. But if we have to—"

Dick hesitated. Sally put her hand on his arm.

"He's right," she said suddenly. "Let him think it over."

Dick hesitated a moment more, and then nodded slowly.

"I see— Death rays would be bad—" Then he shrugged. "I've got something to work on anyhow, though. You'd better get your share of sleep. You need it more than I did."

"Sure," said Blaisdell. He grinned mirthlessly. "I mustn't crack up, eh? I might turn into a trog!"

But he smoothed out his own diagram and put it carefully in his pocket again. He stood up.

"There's one good thing," he said jerkily. "If a man . . . works long enough he can get sleepy enough to . . . sleep and forget he's a . . . man."

He went shambling off to his sleeping quarters. Sally looked after him with a troubled expression.

"It's pretty terrible, Dick."

"He's in love with you," said Dick.

She nodded.

"It wasn't so bad before I . . . we—" She looked up at him appealingly. Dick kissed her. Presently he frowned and then gloomily went back into the transplanted laboratory. Sally followed him.

"Keep away from me!" said Dick. "I'm in love with you, too, and there are trogs in this world and we've no defense against them. With what Blaisdell just worked out, I'm going to make one. But if you touch me I'll kiss you, and I need first to make you safe. So keep away from me!"

He sat down at the worktable in the larger underground room. He began to sketch out an electronic circuit. Any man who could design and if necessary build an encephalograph or the other infinitely delicate apparatus of a modern parapsychological laboratory would naturally be able to design simpler things. Dick scribbled the outline

of the circuit, talking as he worked.

"Blaisdell's a genius," he said shortly, "and like all geniuses he's bound to be unhappy. But I wish he didn't have those freak brain waves. Nothing's showed up in him. It might show up if he had kids. But it might be worth the gamble for . . . well . . . the world at large."

He used a slide rule and then threw it impatiently aside.

"All I've got to do is throw together a high-frequency relay with one automatic control. I'll take things apart and stick it together anyhow."

"What will it do?" asked Sally.

"Smash trogs," said Dick, briefly.

He regarded his diagram meditatively for an instant, and then changed it here and there.

"I'll take the amplifying bank out of the encephalograph," he said abstractedly, "and hook it onto that big power tube. Then that control—" He got up restlessly, heaved the hastily-piled apparatus from upstairs around, and came back to the workbench with two or three complete items and half a dozen parts. He set to work with a screwdriver and pliers. "This is strictly cobbling, but if Blaisdell is right, trogs radiate a carrier wave besides that short stuff. I'm making a straight amplifying relay with automatic frequency control. It ought to pick up any carrier wave that comes around, step it up a few hundred thousand times, and spit it back. I've got a sealed-cascade tube that'll handle ten kilowatts of power. Which ought to be plenty!"

Sally frowned in concentration.

"Don't frown," said Dick. "I'll show you in a minute."

He worked busily. But it was not one minute, but nearer twenty, before he stood back from a hopelessly untidy assemblage of assorted parts. He made careful, cryptic tests with an ammeter and a tiny oscillator, separately connected. Then he said:

"Now we'll see what happens. This little oscillator is sending out radio waves I haven't bothered to measure. This impressive assembly of junk is supposed to pick up anything like a radio wave—any wave length at all—and step it up and give it the heave-ho right back. And any circuit which will radiate a given wave length will also absorb that wave length. Hold your hat!"

He stood back and threw a switch. For an instant nothing happened. The tubes in the junk-assembly were warming up. Then the other, the little circuit, suddenly glowed white-hot throughout its length, arced, and collapsed into smoking, molten ruin.

Dick breathed a sigh of relief.

"We'll leave the thing on," he said. "And *if* that trog gadget sends out a carrier wave as Blaisdell says and I believe, and *if* a trog comes within whatever range this dinkus has, and *if* he turns on his little gadget to come in here and annoy you, Sally—why I think he'll be sorry. So I think I can take time out to kiss you."

V.

Hamilton arrived some hours after sundown, in an Army helicopter. It was one of the larger type, used for freight. The Army was depending heavily on helicopters for its civilian patrol work. Airfields simply weren't any good, these days. They had no repair facilities, they were jungles of

weeds, and there wasn't a radio beacon still in operation in the United States, except the one shooting out from a New York airport for the transatlantic places which now would not come any more. The great vertical airscrews of the helicopter made almost a drumming note as it settled beside the laboratory.

"You're to come back to New York with me," said Hamilton abruptly. "Those questions you asked yesterday . . . no, day before yesterday . . . have started things going. And we've done our share, too! Here!"

He was down in the underground room, with its spotty improvised lighting making it look particularly uncivilized. Two of the four-man crew of this larger helicopter had come down with him. They grinned suppressed grins as Hamilton rather dramatically tossed out two small, rounded metal boxes, three inches by seven, now wrapped round and round with bundles of branching metal filaments.

"A couple of trog gadgets," said Hamilton. "And you can open them up and play with them! They're harmless now, and they won't explode!"

He waited for expressions of amazement. Dick said with polite enthusiasm:

"That's swell, Hamilton! Swell!"

Blaisdell was unimpressed. He picked up one of the two objects, unwrapped the cable, and flicked it open. He looked inside, poking informedly with his finger.

Hamilton blinked, a trifle dashed by the relative failure of his sensation.

"How'd you get 'em?" asked Dick. "It was nice work."

"Why," said Hamilton, "the Army had to use the civilian airport because trogs kept setting off bombs to shatter planes at the regular army airfield. So they knew there were trogs there. And they announced danger of an epidemic and had everybody on the army field file through the infirmary for a check-up. It's happened before. But this time they had an X-ray machine behind a partition and as the men moved along the line they got X-rayed without knowing it. Only three of us knew, and we spotted five trogs by the shadow of

these boxes, and of course the network of wires they have to wear. When the men got to the place where they went one by one into the examination room, those trogs were knocked cold as they stepped inside. We stripped their gadgets off, tied them up and gagged them, and hid 'em away. Then we rushed the gadgets to separate places."

Dick grinned.

"Have the trogs talked?"

"Not yet."

"Hm-m-m," said Dick. "And how'd you get the boxes open?"

Hamilton seemed to expand a little.

"Why—we put them in a vacuum chamber and pumped out all the air. Then we dumped 'em in oil and let the air pressure back. That forced oil into every possible crevice inside. Then we froze the oil solid. No striker-pin could move to detonate anything. Then—we opened 'em and took out the explosives." He said anxiously, "There's a complicated circuit in there. We've got a couple of our best men—not in New York—unraveling it. Meanwhile we snipped the battery leads so these couldn't possibly turn on. All right? I begged these for you chaps to look at."

Blaisdell seemed to have finished his inspection.

"Pretty good," he said grudgingly. "But only pretty good." To Dick he said disparagingly: "I gave 'em . . . too much credit. I thought they'd do their . . . capacity stuff for the . . . short waves with their leads. But look at this! They had to correct for lead capacity and then get . . . practically the same capacity back with this dinkus our picture didn't show! Sloppy stuff!" He growled to Hamilton. "I'm going to . . . tinker with this a minute. Make it into . . . something Dick worked out this afternoon."

He went over to the workbench. Hamilton looked unhappy.

"Is it—safe?"

Sally said proudly:

"He and Dick know everything about the trog gadgets!"

Hamilton uneasily dismissed the question.

"Now—how about coming back to New York with me? A plane came in from Europe three hours ago. Three European governments have sent men over to talk to you, because of those questions you asked yesterday. With everybody at the Pyrenees conference killed, those questions make you rate pretty high."

Dick said over his shoulder:

"Blaisdell, what say?"

"Safe enough, with that relay of yours working," grunted Blaisdell. "Give me an hour, first. Then we'll—be sure."

He settled down to work with minute tools—an almost microscopic soldering iron; pliers with reduction levers operating their jaws so that infinitely tiny wires could be handled and bent for the most precise of miniature circuits.

Sally cooked a dinner for Hamilton and the four men of the helicopter's crew. Hamilton took the four of them to see the empty laboratory by flashlight, and in spite

of the darkness essayed to dramatize how he had sat frozen while the first known trog ever to be killed walked into a trap. There was a strictly informal burial of that trog. Dick and Blaisdell simply hadn't gotten around to the chore. The five men who had come from New York found themselves completely unaffected. Those who now believed that civilization had not collapsed from a natural cause —a mass neurosis—but had been destroyed of deliberate intent—such men were not apt to be affected by the sight of a dead trog. They were filled with a cold hatred so deep that it hardly showed in their manner.

Afterward they loaded such apparatus as Dick pointed out into the helicopter. The junk-assembled relay he had contrived. The Ganish thermobatteries which powered the laboratory. This, that, and the other thing.

Blaisdell came out with the trog gadget, stripped of all but a single external wire. He handed it to Sally.

"Strap this around your waist under your jacket," he said curtly. "Then—put on this bracelet. It's wired to the set and—there's a sponge that'll stay wet."

Dick said: "Something?"

"Same thing as the big one. Automatic relay. Set to the trog carrier wave. If a trog tries his stuff, this'll neutralize it. 'Fraid it won't burn his set out, but his tubes won't work, anyhow. All right? When you get it on, Sally, push that button and start it. It'll make a noise, by the way, if it's called on to do anything. I put in a vibrator."

"Are you ready to go?" asked Hamilton.

"Sure!" said Blaisdell. "Now that Sally's safe."

The helicopter took off. Darkness spread out below them. In near-silence the big craft drifted smoothly to the east. There were stars overhead, filling the sky with brilliant points of light. But the earth below was seemingly lifeless. At ten thousand feet they could see exactly two tiny specks of yellow flame—lighted windows.

"About those men from abroad," said Hamilton. "There's one from Rumania, who was assistant to one of the men at the conference. He lost no time getting over here. There's an old fellow from Germany who didn't go, and there's an Englishman. It turns out that every one of them had suspicions. They'd accepted the mass consciousness theory because there wasn't any better one. The old chap from Germany still thinks there may be something in it. Pretty old, though. He says he studied under Sigmund Freud! When we told them what we'd taken from those five trogs they itched to examine them, but the Army was working on three and I'd insisted you should have the other two. Since you seem to have gone farther than anybody else—"

"Thanks," said Dick, abstractedly.

Sally said in a slightly strained voice:

"I think it's very lucky. Very lucky! I think you did the marvelously right thing, Mr. Hamilton."

Dick jerked his head around to stare at her in the darkness of the helicopter's cabin.

"Just what do you mean by that, Sally?"

"I've been making—generalizations," said Sally uncomfortably. "You said we ought to wait until we had more facts. But we've got a lot of them now. Trogs aren't a symptom of mass-weariness of civilization. They aren't people who're working for themselves, because they didn't steal conspicuously, and they were working under direction. Somebody certainly arranged . . . my father's death, with that of every other man at the conference. Somebody directed the destruction of civilization. Somebody—most likely—even directed the spread of that mass-consciousness theory. It was the one thing which would take the heart out of everybody who believed it. They thought that in trying to save civilization they were fighting themselves. Now we know it isn't so. We know somebody—some group of people—is deliberately trying to smash civilization. And I think we ought to try to guess who."

"Some—group of people," said Dick. He drew a quick breath. "You've got it, haven't you, Blaisdell?"

"I think so," said Blaisdell. His voice was muffled. "And—if we need it I've got that diagram with me."

There was silence for a moment. Dick marshaled his facts deliberately. Below the helicopter the sprawling edges of what had been the world's metropolis lay dead. All over the earth just such cities lay in just such abandonment. Their streets were emptied. Their buildings began to show neglect. People could not live in them any longer, save in smaller numbers than the same area of waste land would have supported. Birds had moved in, to be sure. The deserted cities were sanctuaries for birds. And other wild things were moving in, too. Little rodents, and foxes which preyed upon them. Rabbits and moles and owls and ferrets found the cities of men far safer hiding-places than the woods and fields. Men were too common there, now! Dead cities could become the wildernesses in which wild things lived.

"It all fits together," said Dick in an emotionless voice. "I almost hate to say it, because maybe it's worse than the theory we were told was true. It's bad enough to think that civilized men could smash their own culture because they were tired of being decent and comfortable and free. Civilized men are more free than barbarians can ever be! But we were heading toward barbarism, and we were accepting an explanation that was the absolute peak of pessimism. We weren't individuals, this explanation said, but part of a mass. What we wanted, as individuals, didn't count, nor what we did. The mass was everything. We weren't separate people. We were members of that mass. And that mass had become—as Blaisdell said—a sort of deity which took everything and gave

nothing, not even consolation. It was neither good nor bad. There was no such thing as right or wrong, except as the mass determined it. There was only this mass which was all of us, arbitrary and in the last analysis sick, which had developed a savage hatred of all that we consciously desired and believed in, and . . . we were motes, impotent atoms, who had willy-nilly to submit—" He stopped and said shortly: "Very familiar doctrine, when you substitute another word for mass."

Hamilton started.

"Race! The racial theory in another—"

Dick wet his lips.

"The trog masters, the men who set other men to pull down civilization—they set that doctrine afloat. Not too difficult, at that. Psychology was always a specialty in their society. They used it—more than any other people. They tried to fight wars with it. Twice, that some people now alive can remember. Both times they were defeated by another specialty. Technology. Industry. Both times they collided with us, with the United States. We had the greatest industrial machine in the world, and the best technologists. We didn't have huge armies, and we were pretty bad with psychology—though it was an American named Rhine who founded parapsychology as a science—but we could make things. We preferred to make electric refrigerators and automobiles that everybody could own—and we did. But we could make guns and war planes, too, if we had to. We could make more of them, and better, and we could use them better too, because they were technical devices, and that was our specialty! We beat the trog masters with our technology and our industry. Twice. The last time we smashed their industry so they couldn't make any weapons at all. We thought we'd crushed them forever."

Sally said confidently:

"We'll do it again, Dick. We will!"

Dick laughed; a rather ugly laugh.

"It's already done. They went underground, those trogs who hated civilization and freedom, and wanted barbarism and slavery for all the world. For ten years they worked in secret. They wanted to fight again. They don't like civilization. They hate it. They won't have it! But when they fought before, we beat them with our industries. So this time they planned to fight a war in which industry or technology wouldn't count. In which weapons would do no good, and machines would be useless. Some one of them got hold of the fact that certain wave lengths—one point sixty-seven centimeters—would have psychological effects. Psychology was their specialty. They set to work to smash civilization with a psychological weapon. And they overlooked just one thing!"

Hamilton said, his voice purring with hatred:

"When they said they had smash-ups there, it was a lie! They faked them! Nothing's happened to them!

It's the rest of the world that has gone downhill!"

"Just so," said Dick dispassionately. "They faked their alleged catastrophes. For nearly four years, now, the rest of the world has been crumbling. We've had no industrial production at all for two years, and practically none for three. Transportation is just about stopped, even by air. So the trogs have had three years in which the rest of us believed all the world was breaking up. They had it as a breathing-space in which to make a new industrial machine and turn it to the making of . . . guns and such. We're smashed. We're shattered. We're disarmed and our industries and transportation stopped dead. Our cities are empty and our factories useless, and the same human devils who brought it about are among us right now to slap down every attempt we make to get anything working again! While they . . . well, now they ought to be about ready to take over their victory."

Blaisdell said in a muffled voice:

"They've got to move at once, Dick. You asked questions, and they can't have questions asked. Sally's father and the others must have had some good questions to ask—and so they were killed. We . . . may be going into something pretty hellish right now. They've got to stop questions!"

"But they can't," said Dick. "I know! They may get us as individuals, but they've lost because they've forgotten something. They haven't realized that they'll run up

against exactly the same thing again! Our industry and our technology!"

Blaisdell chuckled. Hamilton stammered.

"Handling one-point-sixty-seven waves," said Dick with a faint, hard grin, "is a technical problem. We've got hundreds of thousands of people able to work on it—and they'll work! Making the apparatus to handle it is an industrial problem, and there are thousands upon thousands of little radio-television shops that will sweat it out in the back workroom, not to mention the amateurs, the hams, the home-workshop addicts in small towns and villages who could always turn out trick televisors and the erratic supersensitive outfits that were too tricky to be commercially practical. We've got the technologists and the industrial capacity, all right, to handle the technical devices the trogs have tried to fight a psychological war with!"

A pause. Then Sally said, in blindly confident concern:

"But Dick—what can we do with them after we've won? They were Prussians a hundred years ago, and they were unbearable when they

won in 1870. They were Germans in 1914 and were beastly until they lost. Then they turned Nazi and acted like madmen until we smashed them. Now they're trogs! They're the same creatures, the same minds, the same . . . enemies of the rest of mankind that they've always been! What can we do with them?"

Blaisdell said with another chuckle, there in the dark cabin of the helicopter:

"No postwar plans yet, Sally! Not yet! This is strictly an undeclared war, and we haven't started to fight yet! I've got a hunch that the trog leaders already know that if they don't take over their victory in the next day or two they'll never have it."

Hamilton said blunderingly:

"Look here! You mean . . . you mean—"

"Listen!" said Blaisdell jerkily. "The last two times we've licked them. We, the United States. Other nations had manpower and courage and everything that we take off our hats to, but it was our industry that was decisive. This time they've . . . got the world if they can . . . occupy the United States . . . restore the trivial things that . . . smashed us up, and hold us Americans as slaves. They need England too, of course. They'll take Czechoslovakia again. Maybe they already have! They may have had the Czechs slaving for them for months or years back! We wouldn't know! But they've got to take us! They've got to! And this time they'll—hit us first! And I give 'em less than thirty-six hours to have a chance to win. Even then—"

He was abruptly silent. The plane began its smooth, purring descent. It went down and down and down. Hamilton said in a strangled voice:

"There was a plane out over the North Atlantic. It . . . suddenly opened up on commercial frequency and said it sighted ships below. Hundreds of ships, all steaming west. Then, all of a sudden, the man who was talking screamed. And then we couldn't raise him any more. We thought . . . we thought it was a hoax. Some people play jokes even now."

Dick said evenly:

"You'd better play with that circuit of yours, eh, Blaisdell?"

The helicopter landed. Army officers met them.

"Something's happening," said a voice in Dick's ear. "In the past hour, radio stations that have been going right along have been dropping off the air. All over the country. Just cutting off without warning."

"One can make guesses," said Dick bitterly. "Radio was good stuff as long as it spread hopelessness. But if there's something going to turn up to make people mad, better no radio."

He realized that the phrase was cryptic, but it would take too long to explain. It fitted into the pattern, though. With all radio transmitters out, news of an invasion could not travel even as fast as the invasion army itself. There could

be no concerted defense at all. The country was helpless.

Dick took Sally's arm and went with her through the blackness. They went into what had been the reception center at the airport. It was brightly lighted, but the upholstery was faded and in places tattered. The room needed dusting. It was somehow an expression of hopelessness.

There were half a dozen others waiting. Two Army medical-corps men, psychiatric branch. Three men who were obviously foreigners. A high-ranking Army officer who listened in a frowning attempt to understand the technicalities of psychology and parapsychology in the talk. It stopped as the party entered. Hamilton moved forward.

"Ah!" he said in a queer tone. "Here we are! M. Gigskin, of Rumania, Herr Glaunfeldt, of Germany, and Mr. White-Barrett, from London. Let me present Miss Sears, Mr. Drummond, and Mr. Blaisdell."

The tableau was curious. The Rumanian was small and dark and intense. The German was portly and bearded and elderly. The Englishman was lean. He smiled hopefully. Dick and Blaisdell were not at all dressed up, and there were work stains on Blaisdell's hands. Sally looked very tired.

"Ach," said the portly German. "They are so young to haff found out so much! The science of parapsychology will be indebted to you, *Herr* Drummond." He asked inquiringly of Hamilton, "And these are all? Did you not say the entire laboratory staff would come here to work upon this problem with the superior facilities?"

Hamilton nodded, unsmiling.

"They are the laboratory staff, *Herr* Glaunfeldt."

The German looked around, beaming.

"Think!" he said. "In this room is gathered the hope of civilization! Efery man who hass genuine hopes of solfing the decay of humanity iss here!"

He put his hand to his waist. Dick made a sudden, startled movement. Then he grinned savagely. He was in the middle of a raging leap when a sharp buzzing note came from under Sally's short coat. Dick landed. He struck ruthlessly; brutally. The German, taken utterly by surprise, collapsed with an expression of stupefied amazement on his face.

Dick pulled savagely at him. His beard came off. His hair was a wig. Dick went grimly to work, digging through layers of padding to get at the man's skin. He found something, and dragged it furiously away. It was a rounded metal case, three inches by seven, with trailing filaments of wire sprouting from it. There were two buttons at its top. He pressed one of them.

The sharp, buzzing note from under Sally's coat stopped abruptly.

Dick said calmly in the dazed silence that followed:

"They must think we're in very bad shape, Blaisdell. He padded himself with explosives and primers, for emergency demolition. You'd think they'd credit us with

still having explosives, wouldn't you?"

The German stirred. He opened his eyes. He found himself surrounded by grim-faced, coldly hating men. Revolvers covered him. He saw the rounded case, quite harmless, in Dick's hands.

His face went startlingly white. He got to his feet. There was only absolute, bitter stillness. He moistened his lips.

"Well?" he said, in suddenly excellent English. "Well?"

"Trog!" said a voice in tones of curdling fury. "Trog!"

The German looked ridiculous. He looked stunned. He could not take his eyes from the rounded metal box in Dick's hand. He pulled off his absurd fuzzy wig and threw it on the ground. Then he drew himself up haughtily.

"I do not know the term," he said arrogantly. "However, I warn you that I am an officer of the German Army. I suppose I am a prisoner of war. But I warn you that any discourtesy offered me will be amply avenged within twenty-four hours!"

There was a sudden grinding of teeth. Dick glanced at Blaisdell. Blaisdell's hands opened and closed. He looked at the German with a hatred so bitter that it was sheer, sick passion. Then he turned to Dick.

"I've . . . got to make it," he said jerkily, his voice thick with rage. "There shouldn't be . . . such things. I've . . . got to make it! He said twenty-four hours! Tell these chaps to let me have a shop and stuff to work with!"

VI.

Army planes took off in darkness and flew north and south and west. Each carried copies of all the data that Dick and Blaisdell had gathered—including diagrams of the tiny relays which would paralyze a trog's belt-apparatus. Such relays, made with automatic-controlled frequency, would protect any area from the brain-wave apparatus which had enabled trogs to bring American civilization down in ruins. It was again possible to make repairs, with assurance that now they would stay. With the automatic control feature, too, even a change in the carrier wave the trogs used would do no good. Any oscillating circuit in their vicinity would be paralyzed if not melted down, once they were turned on. And Americans could begin to rewind their dynamos, repair their power plants, restore their water systems and begin again to be civilized.

But it would take time. And time was precious. Army planes were precious too, since not one factory-built airplane had been made in America for three years. But an Army plane flew out to sea. It sent back a continuous beamed signal of audible frequency. Its gyro pilot was turned off, and there had been certain specific things done to its inherently stable design.

It flew northeast. Its pilot was looking for a surface fleet. If he could, he would report the fleet and

get away. But just in case he was jumped from a cloud-ambush and shot down without warning, the plane had been altered to dive immediately he could no longer make the constant controlling movements it now required. If he were blacked out by the brain-wave control, he might dive out of its field and so get away. If not, when his plane hit the water its sound signal would cease.

The signal ceased, a hundred and twenty miles from the Narrows.

Dick went down to the water front where Blaisdell worked doggedly. He had been at work all night long, and his face was drawn and haggard—but not only by fatigue. He stopped when Dick appeared.

"I've been trying to decide," he said bitterly, "whether to show you the stuff or not. You know what it is."

"I don't think you need to show me," said Dick.

Blaisdell's face twitched.

"Tell me," he said jerkily. "I'll feel better if I don't tell you."

Dick pulled an envelope out of his pocket. He drew a curved wave form in pencil. It was the outline of a brain wave, as an encephalograph records it.

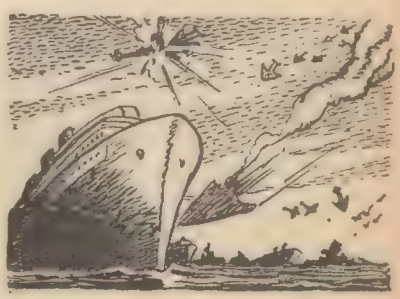
"Here's a normal cycle of Paulson waves in normal consciousness, normal brain," he said briefly. He indicated it. He drew another. "This is a bit abnormal—"

"It's very like mine," said Blaisdell bitterly.

"And this," said Dick evenly, "would show epileptic tendencies. This"—he drew a fourth line—"is the cycle when a man is in a state of catalepsy, all consciousness gone and his body rigid. In between those last two comes this"—he drew —"which is the narcoleptic wave form the trogs use to make people blank out. They induce that form with one-point-six-seven waves."

Blaisdell did not stir. Dick drew the sixth curve.

"The others make a sequence," he said evenly. "Carried one step



beyond, we had epilepsy, narcolepsy, and catalepsy. Carry the wave change one step farther and you'll get this. It would be—necrolepsy. If your brain made a brain wave like this, you'd die. Instantly." He paused. "You're making a beam projector for one-point-six-seven waves, and you're going to modulate the beam—like this."

Blaisdell drew a deep breath.

"You win!" Surprisingly, his tone was almost normal. He grinned a little, crookedly. "That is a death ray, and people shouldn't have death rays. So I didn't want to tell you. But I feel better that you know, just in case— I figured

I'd use it today anyhow. I have to! There'll be plenty of thousands of Germans on those ships. They'll land here with dive bombers and machine guns and tanks and everything else. I suspect they'll use gas freely, too, because nowadays there aren't any more gas masks, and we haven't got factories going that could make them. Yes, surely they'll use gas. I think I know what they expect to do."

"So do I," said Dick.

"They plan to take over everything," said Blaisdell, his voice hardening. "They'd announce that the mass consciousness of the human race was sick of civilization and had smashed it. But that the German race was somehow inherently superior, or favored by the mass consciousness, so that Germans could be civilized. They could stand it. The rest of the world couldn't. So Germans would be the civilized people of the future, and the rest of the world would be hewers of wood and drawers of water for the favored strain. All the rest of humanity would be peasants or serfs, abjectly subject to the Germans who—it had been proved—alone could be civilized and distribute some few—very few—of the benefits of civilization to the inferior breeds. But if the Germans ever ceased to be so benevolent as to rule all other people, then those others would sink lower and lower until they became shivering, starving cave dwellers, unable even to make fire. In fact, troglodytes—"

Dick nodded.

"Give them a hundred years, and they'd have people believing it," he said quietly. "They'd be believing it themselves in ten. Right. Would you rather that I handled that ray, Blaisdell? I won't like it any more than you do, but it's got to be done."

"I'll do it," said Blaisdell. "You're going to marry Sally, I'm glad of it, you know. I couldn't, in decency. And Sally's husband shouldn't have to remember . . . this trick. So I'll do it." He paused. "You know how to fix up another of these if necessary? I'm using sparks to generate the stuff, and reflectors to concentrate the beam. You'll find all the parts you need in the shop where I worked."

"You sound as if you didn't expect to come back," said Dick sharply. "There'll be nothing to stop you!"

"Precaution," said Blaisdell, grinning. "Nothing more. Another precaution, Dick," he added seriously. "When our people start back for Germany, they'll stop and clear out the trogs in other countries on the way. It's going to be a big responsibility, deciding what's to be done with the Germans this time. We won't want to take it all alone. When we move into Germany, it'll be all Europe moving in at once—and part of Asia, too."

"It wouldn't surprise me," said Dick.

"Now, when they go in," said Blaisdell, "you take Sally off somewhere and cut off the radio and stop the newspapers. She won't want

to hear what happens. Do that, Dick, huh? She's a nice kid. She wouldn't like to hear."

"I will," said Dick.

"Now clear out!" ordered Blaisdell gruffly. "I've got another hour's work to do on this, and that German fleet ought to be getting close. They were a hundred and twenty miles away an hour ago. I've not more than three hours altogether before they'll be steaming in the Narrows, and this tub that's all I could get is slow as the devil. So . . . long."

Blaisdell turned his back abruptly and went back to work. Dick returned to the airport. He shouldn't have left it. He was showing the electricians on the post how to set up the oscillators that paralyzed the trog circuits. He'd set up the ten-kilowatt machine in one of the hangars, and ordered every man on the field into the huge room. Then Army officers ordered them to strip. There were three trogs among the personnel, here. Stripped, they would be exposed at once. They turned on their brain wave devices. And the ten-kilowatt relay did not merely paralyze the tubes in them as Sally's small relay had done. It burned them out. And they had been prepared to explode if opened. They exploded now. The three trogs did not need to be convinced.

There was already something approaching mass production of oscillator relays in the electric shop. It was the first resumption of industry in the United States. But the German fleet was coming in, blandly and arrogantly steaming to occupy a continent sunk in barbarism.

They steamed for the entrance to New York harbor. The only sign of life there was an ancient, almost water-logged motor-scow blundering out to sea. A cloud of planes floated over the German fleet. There were not many recognizable fighting ships; the majority were transports, crammed with men. There were a few cruisers, though, a few more destroyers, and one solitary battleship. The battleship had once been British, and it had put out to sea two years before and never been seen again. There were two French cruisers, and one Russian, and two that looked Swedish. All the ships flew the swastika flag—outlawed long since, like the skull and crossbones.

Men moved on the scow. One man bent over something at its bow. Nothing happened. A flight of planes suddenly streamed ahead, split up, and settled down confidently upon the airfields of the city. There could be no opposition, of course. Trogs at those airfields would long since have paralyzed every living human being there. The planes settled down and vanished.

The fleet came on. A plane suddenly went out of control and skittered crazily into the water. The precise alignment of the ships seemed to lessen. Those slight corrections of course which must always be applied to keep ships in formation, were not being made.

The planes seemed suddenly to go crazy. Some darted down as if to attempt voice communication with ships which no longer answered by radio. Then they went mad in midair. Some dived insanely into the sides of ships. Others plunged foolishly into the water. There was a collision in midair and other planes seemed to be attracted to it like moths to a candle.

A far-ranging plane saw the slowly moving scow. It dived zestfully. Its machine guns spattered. There was no possible purpose save sport. Bullets spattered the scow. The man at the bow moved again, and light glittered on the object he controlled.

The diving plane veered in an insane, suicidal fashion. It hit the water and ceased to be.

The formation of the fleet was hopelessly lost. One ship crashed another. One ran aground, and its propellers continued to thrash the water uselessly as if to drive it further ashore. There was no longer a fleet. There was merely an assembly of ships, hundreds of them, steaming on absurdly without plan or direction, as if dead men were at their helms.

Dead men were.

On the scow the man by the queer apparatus staggered. A machine-gun bullet had hit him. But he picked up the apparatus he would let no one else touch, and essayed to carry it to the cabin—and the lurching scow added to his uncertainty. He lurched overboard with the device itself. Blaisdell was the only American killed in the German invasion of America.

But there were many Germans killed, aside from those who had been on the ships. Some planes landed, and Germans got out, beaming—and they were greeted by men with burning eyes who were not at all helpless, and who were seemingly reluctant to accept even the most passionately screamed crises of surrender. But when the last of them was rounded up, the invasion was over.

Definitely.

Dick went west next day, with Sally, to help start civilization going again. He didn't want to stay for several reasons. One was that he was being urged to duplicate the apparatus with which Blaisdell had wiped out the German invading army in its ships. And Dick didn't want to do it. He didn't want to turn a death ray loose. And it wasn't needed, anyhow. When you weren't using 1.67 mm waves as a sneak device, but frankly in projectors, with reflectors to guide them, nonlethal waves were as effective as any army could require. Dick designed a modulation that would be very persuasive without killing anybody. He urged that no modification be tried. And he was the supreme authority on such matters, so none was tried.

THE END.

He was able to run one of those perfected, foolproof spaceships, able to navigate a little—but like most crooks believed he knew the whole story when he'd heard the first chapter!

"Trojan Fall"

by HAL CLEMENT

Illustrated by Orban

A galaxy should be a perfect hiding place. A hundred billion suns and a hundred thousand light years form an appallingly large haystack in which to seek any such submicroscopic needle as a man, or even a planet. A photograph of the Milky Way, or, better, a projection of such a photograph, can give some idea of the sense of confusion which is experienced by anyone faced with the task of combing such a maze.

That was La Roque's first impression, and his views of the galaxy had not been confined to photographs. Admittedly, he was used to interplanetary rather than interstellar flight; but it is almost as easy to get lost inside solar systems as between them. So, when it became a matter of expedience for

him to disappear from sight for a time, he decided quite abruptly that Sol's little family was too crowded.

Getting a ship, even legally, was not too difficult; flight between Sol and the nearer stars was fairly common, and only the usual customs restrictions applied to private journeys. La Roque intended that his journey should be more private than usual.

He purchased a craft; the event which made departure so urgent had left him with plenty of funds. She was about as small as a second-order flyer could be: a metal egg about seventy feet long and thirty in diameter at the widest point. She had the required two second-order converters, either capable of holding the ship and six hundred tons of additional mass in the necessary condition for interstellar flight above light-speed. Her actual capacity for freight was nowhere near that figure, of course. The converters consumed mercury, but could be modified to take any reasonably dense metal of low melting point.

La Roque preferred the concealment of crowds, and for that reason chose to make his departure from the ever-busy Allahabad port. It was a little before midnight, on a July evening, that a pilot beam guided his ship beyond the Earth's atmosphere; by 1 a.m. he had switched free, pointed the blunt nose of his ship at the center of the Milk Dipper's bowl, checked his personal equalizer, and shunted into second-order flight. The universe around him remained visible after a fashion, but aberration altered its appearance vastly. Every star swung forward; and at four hundred times the speed of light, they were all contained in a circular area, centered on his line of flight and a little over eight minutes of arc in radius. Sol was dead ahead, apparently, and prevented any possible view of his goal which might have been furnished by a telescope.

La Roque was not a navigator, and knew no more astronomy than the average educated person of his time. Although the beacon stars Rigel, Deneb, and Canopus would all be visible in any part of the galaxy his ship was likely to reach, they were useless to him. His only hope of eventual return to the Earth lay in the device which, every hour, automatically cut the second-order fields for a split second and simultaneously photographed the heavens dead astern. Even that was likely to be useless if he crossed a region of low star density, where there would be no nearby, recognizable objects on the films to guide his return. He had had sense enough to realize this, and consequently had headed in the general direction of the galactic center. He was reasonably certain of finding a habitable planet; the star that lacked worlds was the exception rather than the rule. Earth-type worlds were rarer, but frequent enough to have forced the enactment of several regulations against unrestricted colonization.

Having made the first step in his getaway, he settled down to figur-

ing out the probable line of action of the law. It would, with luck, be a full month before his means of escape would be deduced, for it was known that he was not trained in cosmic navigation, and his ship would not be missed until sufficient time had elapsed for it to make a round trip to Tau Ceti, which he had indicated at Allahabad as his destination. It would take another day or two to compute his actual direction of departure, from the recording at the observatories which had presumably picked up his "wake." From then on, time would be short; any League cruiser of reasonable size could cover in two or three days any distance he could hope to put behind him in that month. It is an unescapable fact that the speed obtainable from a second-order unit is directly dependent on its size.

Therefore, it was essential that a hiding place be found. A planet, where the ship could be buried or otherwise concealed, would present an impossible search problem to a hundred League ships—*if* there were no inhabitants to hold inconvenient memories of his landing. He might find such a world by random search, but the distance he could travel in his month of grace was limited; and, he realized, very few suns lay within that distance. He got out a set of heliocentric charts and began his search on paper.

There is no excuse for him. His destination should have been planned before he left the ground—planned not only as to planet, but to location on the planet. He had always planned his "deals" with meticulous care; and had sneered at less careful colleagues whose failure to do so had resulted in more or less lengthy retirement to League reform institutions. It is impossible to say why he didn't see that the same principle might apply to interstellar flight. But he didn't.

The reference volume that accompanied the charts was most helpful. Stellar systems were listed by right ascension, declination, and distance; so that he merely had to find the appropriate pages to find in a single group all the systems near his line of flight.

There were twelve suns, in seven systems, lying with a light-year of his course, within the distance measured by a month's flight. Such a number was most surprising; chance alone would not insist on even one star within a cylinder of space two light-years in diameter and thirty-five long. Most of them, of course, were "dead" stars, detectable at only the closest range. Six of them had planetary systems; but the planets, without exception, possessed surface temperatures below the freezing point of mercury.

That was unfortunate. To remain alive on any of these worlds would demand that he stay in the ship, and use power, for heat and light. Even such slight radiation as that would cause meant a virtual certainty of detection by even a cursory sweep of the planet on the part of a League cruiser. He had to find a place where the ship would remain at least habitably warm with-

out aid from its own converters. He could do without light, he thought.

The problem would not have bothered a pilot of even moderate experience, of course. The ship could easily be set in a circular orbit of any desired radius about one of the stars. Unfortunately, there is a definite relation between the mass of a star, the radius of the desired orbit, and the amount of initial tangential velocity required; and this simple relation was unknown to La Roque. Trial and error would be very unsatisfactory; the error might be unnoticeably small to start with, and become large enough to require correction when searchers were around. A worried frown began to add creases above La Roque's black brows as the little flier raced on.

The spot of light in the front vision plate grew paler as Sol, who provided most of its radiance, faded astern. Within a day, he was merely a bright star; in a week, dozens of others outshone him whenever La Roque cut the drive fields. Space, the runaway began to realize, was a terrifying lonely environment. Earth was beginning, in his memory, to assume a less forbidding aspect.

Two days out, he passed the first of the seven systems. It was not visible, at half a light-year, even when the fields were off; the chart reference described it as a binary, both stars cool enough to have clouds of solid and liquid particles in their atmospheres, and neither emitting any visible radiation to speak of. The relative orbit was of almost cometary eccentricity, with a period of about seventy years. The suns had passed periastron about a dozen years before, without anyone's being greatly concerned.

It was a dry collection of data, but it jogged La Roque's mind into recalling something. He had been picturing the result of an error in establishing an orbit, as being a spiral drop into the star he had chosen. Now he recalled that he would merely find himself in a slightly eccentric, rather than a circular, orbit; and if the eccentricity were not great enough to bring his periastron point actually within the star's atmosphere, it would be perfectly stable.

The idea attracted him for a moment; even he could set up a passable concealment orbit. The possibility of being alternately too warm and too cold was unpleasant, but not forbidding. The system he was passing would not do, of course; he took it for granted that the perturbations produced by the companion star would nullify his attempts. However, four single suns were among those he had looked up along his course, and were within easy reach.

It remained to choose one of the four. Any reasonable and normal person would have without hesitation laid a course for the nearest; La Roque, under the elemental motivation that sent an incognito Hitler to Borneo rather than Switzerland, chose the farthest. Perhaps his gambling spirit had something to do with the choice; for there was

actually some doubt that he would reach the star before a League cruiser would come nosing along his wake into detection range.

From where he was, the runaway could not lay a direct course for his chosen hideout. His knowledge of solid geometry and trigonometry was so small that all he could do was to continue on his present course until the proper heliocentric distance was attained, then stop, put Sol exactly on his beam, hold it there while he turned in the proper direction, and again run in second-order flight for a certain length of time—dead reckoning pure and very simple. By thus reducing his goal position to a known plane—or near plane; actually the surface of a sphere centered on Sol—he could get the course of his second leg by simply measuring, on a plane chart, the angle whose vertex was the point in the sky toward which he had been driving, and whose sides were determined, respectively, by some beacon star such as Rigel or Deneb, and the star of his destination. He dragged out a heliocentric chart and protractor, and set to work.

Time crawled on. The nearer stars, on the trail photographs, drifted sluggishly toward Sol. La Roque found a photometer, and managed to obtain with its aid a check on his distance from the Solar system. He spent much of his time sleeping. There was nothing to read except the charts, astrographical and planetographical references, and the numbers on the currency leaves whose gathering had necessitated his departure from Earth. The latter kept up his morale for a while.

Second-order pilotage is not difficult; it depends chiefly on proper aiming of the ship before cutting in of the converters. There is practically no tendency to drift from the original heading; in fact, it is impossible to turn without cutting the fields and re-aligning the vessel's axis. Actually, the ship will follow the arc of a circle whose radius depends to some extent on the power of the generators, but in any case is so enormous that a "local" interstellar flight may be considered rectilinear. La Roque's intended flight path was so short that his ignorance of second-order field technology made no difference. An experienced navigator, planning a flight across the galaxy, or to one of the exterior systems, would have to forecast and allow for the "drift" caused by generators of any given make and power.

One by one, the star systems La Roque had rejected dropped behind. Each time he fought the temptation to turn aside and seek refuge. Days turned into weeks, three of them, from the time he had chosen his destination. By the most generous estimate, his margin of clearance from the law was growing narrow, when he cut the fields at—according to his reckoning — twenty-eight point seven seven four seven light-years from the Solar System.

He snapped on plate after plate, looking around in every direction. A fifth-magnitude star on the cross

wires of the rear plate was, of course, Sol. He looked for Deneb, but Cygnus was too badly distorted by a parallactic variation of nine parsecs to permit him to identify its alpha star with certainty. Orion was recognizable, since he had been moving more or less directly away from it and all its principal stars were extremely distant; so he decided to use Rigel to control his direction.

He zeroed the cross wires of one of the side plates and, using the gyros, swung the ship until Sol was centered on that plate. Rigel was, conveniently, visible on the same plate; so he snapped a switch which projected a protractor on to it, and swung the ship again until Rigel was on the proper—according to his measures—radius. Using the plate's highest power, he placed the two stars to four decimals of accuracy, released the gyro clutches, and cut in the second-order fields before friction at the gyro bearings could throw off his heading.

His arithmetic said he had eight hours and thirty minutes of flight to his destination. Experience would have told him that his chances of stopping within detection range of his goal were less than one in a hundred thousand; as it was, the chief worry that actually disturbed him was whether or not there was risk of collision. Not too surprising! In dead reckoning, the novice navigator makes a tiny point and says, "Here we are." The junior makes a small circle and says the same. The experienced navigator lays the palm of his hand on the chart and says, "We ought to be here." And La Roque's was the deadest of dead reckoning.

He cut the fields five seconds early, and looked expectantly at the forward plate. There should have been a crimson, glowing coal half a billion miles ahead of him. Of course there wasn't.

For a moment he was completely bewildered; but, as he was a reasonable creature, it was only for a moment. He had evidently made a mistake; not necessarily a very large one. He had already obtained the spectrobolometric curve of the star, and fitted the appropriate templets into the detectors. There would be no confusion; no sun having anything like that energy curve could be picked up by those instruments at more than a few billion miles. The galaxy is crowded with such expiring stars, it is true; but a "crowded" star system still contains a vast amount of empty space.

La Roque "sat down"—strapped himself into a seat, since he was weightless—and planned again. He would have to sweep out the space around him, stopping at least every ten billion miles—every two minutes—for at least the ten seconds the instruments would require to sweep the celestial sphere. A volume of space that could be covered in a reasonable time would have to be decided on, and the decision adhered to. If he started a random search, he might as well open the ports.

The results of some more arithmetic bothered him. A really appalling number of five-billion-mile cubes could be packed into an area that looked very small on the chart. He finally worked the other way—allowing himself one hundred hours for the search. He decided he could cover a cube roughly one hundred and forty billion miles on a side, in that time. He realized sadly that his dead reckoning error could easily be several times that.

He was no quitter, however. He was beginning to realize the chances against him—not merely against his escape, but against his survival; he had long since realized his error in tackling a job about which he knew next to nothing; but having decided on his course of action, he embarked on it without hesitation. He started the sweep.

His patience lasted admirably for the first hour. It stood up fairly well for the second. By the end of the third, the smooth routine of flight — cut-wait-and-watch-flight was growing ragged. When the clock and radiometer dials began to blur, and the urge to break something grew almost irresistible, he called it a day and slept for two or three hours. After the second period, he couldn't sleep either.

Really, he was undeservedly lucky. One of the radiometers reacted after only eighteen hours of blind search. His near hysteria vanished instantly, washed away in a flood of relief; and with hands once more reasonably steady he swung the little ship until the emanations registered on the bow meter.

He noted the strength of the reading, cut in the second-order fields for five seconds, and read the dial again. He knew the inverse square law, at least; he figured for a moment, then drove forward again for eleven more seconds, and cut the fields between twenty and thirty million miles from the source of the radiation.

It was visible to the naked eye at that range, which, in a way, was unfortunate. Had it not been, La Roque would have had a few more happy minutes. As things were, he took one look at the forward plate, and for the next ninety seconds used language which should really have been recorded for the benefit of future sailors. He had some excuse. The star was listed in the chart reference as single; La Roque had chosen it for that reason. However, plainly visible on the plate, revolving evidently almost in contact, were two smoky red suns —a close binary system.

Of course, no one would normally be greatly interested. The Astrographic Survey vessel which had covered the section had probably swept past fifty billion miles out, and noted the system's existence casually as its radiometers flickered. Size? Mass? Companions, if any? Planets? Who cared!

La Roque, of course.

The stars were red dwarfs, small and dense. They would have been seen to be irregular variables, if anyone had looked long enough; for their surface temperatures were so low that "cirrus" clouds of solid carbon particles formed and dispersed at random in their atmospheres. The larger sun was perhaps a hundred thousand miles in diameter, the other only slightly smaller. Their centers were roughly half a million miles apart, and the period of revolution about eight hours. In spite of their relatively high density, there were very noticeable tidal bulges on both.

All these facts would have been of absorbing interest to an astronomer seeking data on the internal structure of red dwarf stars; La Roque didn't know any of them, and at first didn't give a darn. He was wondering how a stable orbit could be established close enough to this system to keep him from freezing without using ship's power. The near-circular one he had planned was out; it would have had to be less than a million miles from a single sun of such late type, and the doubling of the heat source wasn't much help.

He thought of doubling back to one of the other systems which the chart had said to be single; but the nerve-racking search and disappointment he had suffered the first time made him hesitate. It was while he hesitated that memory came to his aid.

There had been an episode in his experiences which had occurred on Hector, one of the Trojan asteroids. Circumstances had caused him to remain there for some time, and a friendly jailer had explained to him just where Hector was and

why it stayed there. It was in the stability point at the third corner of an equilateral triangle whose other corners were Sol and Jupiter; and though it could—and did—wobble millions of miles from the actual point, gravitational forces always brought it back.

La Roque looked out at the twin suns. Could his ship stand the temperature at the Trojan points of this system? More important, could he stand it?

He could. His instruments gave the energy distribution curve of the suns; one of the reference charts contained a table that turned the curves into surface temperatures. He was able to measure the distance between the centers of the suns, from the scale lines on the plate and his distance, which he knew roughly. Half a million miles from the surface of a star whose radius was fifty thousand miles and whose effective radiating temperature was a thousand degrees absolute, the black-body, temperature was, according to his figures, about thirty degrees centigrade. The presence of two stars made it decidedly warmer, but his ship was well insulated and the surface highly polished. It would eventually reach an equilibrium temperature considerably above that of an ideal black body, but it would take a long time doing so.

It seemed, then, that the Trojan point was the best place for him. He could find it easily enough; getting the centers of the stars sixty degrees apart would put him at the right distance. He could find the proper plane by moving around until the two suns appeared to move across each other in straight lines. It would not take long; by varying his distance from the system he could, in a few minutes, observe it through half a revolution.

It took him, in fact, less than an hour to find the orbital plane of the suns. It took him five and a half hours of first-order acceleration at one gravity to get rid of the hundred and twenty mile per second velocity difference between Sol and this system—fortunately, the chart had mentioned the high relative velocity, or La Roque would never have thought of such a thing. In a way, he didn't mind the necessity; it was good to have weight for the first time in nearly a month. He was, of course, a little worried at the amount of time consumed; he wished he had not wasted so much of the commodity in putting Sol so far behind.

He cut the first-order drive the instant his clock told him the speeds should be equal, headed for the twin suns, and hopped for his Trojan point. Since moving bodies were involved, he had to make five legs out of the short trip—he failed to allow for the short period of the system and the fact that he started the first leg several light-hours from his goal.

He got there eventually, however. He sudenly realized that he would have to use first-order power again, to give his ship something like the proper orbital velocity; but even he

was able to understand the proper magnitude and direction of this new vector; the only unjustified assumption he had to make was that the suns were of equal masses, and this happened to be nearly the case. He wasn't too worried; he understood that in a Trojan orbit such small variations are opposed, not helped, by the gravity of the primary bodies. He was quite right.

He cut all his power except the detector relay currents, which did not radiate appreciably. To these he connected an alarm, and set them to synchronize with the low-frequency waves which form the "wake" of a vessel cruising at second-order speeds. Then, abruptly feeling the reaction of the past days, he drifted over to a "bunk," moored himself, and was instantly asleep.

It is impossible to say just how long he slept; he was exhausted mentally and emotionally, and when weightless the human body can approach a condition near to suspended animation, if given the chance. It couldn't have been for very many hours, but the alarm rang for minutes before its sound penetrated to his consciousness. When it did, he had to wait several moments before he could move a muscle.

Recovered at last, he unmoored himself and kicked his body across the narrow cabin to the instrument board, and cut the alarm, cursing. He had forgotten that the bell would radiate, and was not sure that the hull would shield its waves. The detectors were reacting violently, the needles wobbling rapidly from positive to negative limits. He knew that a ship had driven past in second-order flight, but that was as far as he could interpret the readings. It would have required an expert to compute the speed, type, and distance of the ship creating the disturbance.

After a few minutes, the needles quieted. La Roque remained at the board, judging that the ship had not left for good. He was right. The disturbances started again half an hour later, and kept up for hours thereafter—sometimes so feeble as to cause a barely visible quiver of the needles, sometimes slamming them against the stop pins with audible clicks. La Roque was incapable of reading any meaning except changing distance into this phenomenon.

The "wake" of a ship in straight-line, second-order flight consists of a few low-frequency electromagnetic waves, the wave-front being, as can easily be seen, coneshaped, with the ship at the apex. The cone expands radially at the speed of light, and its tip moves forward with the ship—in the case of a military craft, at anywhere up to something like a million light velocities.

If the ship is not in straight-line flight, but cutting its fields and changing direction every few minutes or seconds, the shape of the wave front becomes rather complex. A standard search path spirals around the surface of a torus, and

after a few hours the traces of such a flight would be the despair of a competent mathematician, let alone an amateur at a comparatively fixed observation post. The space for billions of miles around that binary sun was quivering with crisscrossing wave fronts. Each set the needles of La Roque's detectors quivering in tune as it passed him, and each quiver brought beads of sweat to the runaway's brow. His own ship, he realized, had left similiar fronts; and he had shaved his margin of escape much too fine. Had they been given a week, or even three or four days, for expansion at the speed of light, he could have ceased to worry about their being used to trail him.

He wondered just what the searchers would do. They must have trailed him directly to this system, as he had expected. They might try to find an inactive ship in space, but La Roque doubted that such a search would be practical unless there existed detection instruments unknown to the general public.

He wondered if the system contained any planets, to add to the searchers' difficulties. He himself had seen none, and none was listed on the chart; but they would have been nearly invisible in the dim light of the twin suns, and La Roque's faith in the chart had dropped a long way. If there were any, they would be a real help; they would have to be searched mile by square mile.

But the question of prime importance was, how long would the pursuers stay? Certainly, if they had the patience they could outwait him, for their food supply would outlast his; but for all they knew he might have met with a fatal accident, or encountered an organized outlaw base—either could easily happen. If he refrained from radiating long enough, they might decide further search futile. He could do that; the darkness didn't bother him particularly, and the ship was warm enough—a little too warm, in fact. Evidently his figures had not been exact.

Eventually the detectors stopped reacting, and La Roque started waiting. He was still perspiring, less from worry now than from actual warmth. The ship *was* becoming uncomfortable. He removed his outer clothing and felt better for a while.

Time crawled on—rapidly decelerating, in La Roque's opinion. He had nothing to do except notice his own discomfort, which was on the increase. He cursed the ship's builders for failure to insulate it properly, and the men who had computed the tables he had used to obtain the probable temperature at this distance from the suns. He didn't bother to curse his own arithmetic.

Once he was almost on the point of driving farther out, hoping the pursuing ship had gone; but a flicker from one of the detectors made him change his mind. He hung and sweated; and the temperature mounted.

It must have been a hundred and fifty degrees Fahrenheit when he finally gave in. He could have stood more in the open—anyone could—but the air-conditioning apparatus had been stopped along with everything else, and the air in the ship was approaching saturation. With that fact considered, he held out remarkably well; but eventually his will power gave out. He kicked his way feebly back to the board, and snapped on the vision plates.

He lacked the energy to curse. For moments he could only stare in shocked horror at the plates—and realize how misdirected his previous denunciations had been. There was nothing wrong with his ship's insulation; the wonder was that it had held out so well. One of the suns—he never knew which—completely filled the front, top, and port plates with a blaze of sooty crimson; he must have been within thirty or forty thousand miles of its surface. His hand darted toward the activating switch of the second-order drivers, and was as quickly checked. They would only send him straight forward, into the inferno revealed by the front plate. The ship must be turned.

He started the gyros, careless now of any radiation that might result. The control knobs were hot to the touch; and a smell of burning oil reached his nostrils as the gyros wound up to speed. The ship abruptly shuddered and began to gyrate slowly, as one of them seized in its bearings. He watched tensely as the vessel went through a full rotation, his hand hovering over the board; but not once was the glow in the forward plate replaced by the friendly darkness of space. The ship was spinning on its longitudinal axis.

The other gyros were working. He tried to turn the vessel with them. The result was to shift the axis of spin about thirty degrees—and increase its rate tenfold as another of the heavy wheels, spinning at full speed, jammed abruptly. Centrifugal force snatched him away from the board and against one wall; he shrieked as his flesh touched hot metal, and kicked violently. His body shot across the room, reaching the other side at about the same time his previous point of contact was carried around by the ship's rotation.

The specks of carbon cirrus on the front plate were describing circles now—circles whose size was visibly increasing. For part of each turn the nose was now pointing into space; La Roque tried to fight his way back to the board to take advantage of one of those moments.

He might have made it, in spite of the agony of his burns, but the overstrained insulation had done its best. It failed; and failed, of all places, over the water tanks that lined part of the hull. The tanks themselves offered only token resistance as steam pressure suddenly built up in them. La Roque never knew when scalding water shorted the control board, for a jet of superheated steam had caught him just before he reached it.

On the enforcement cruiser, a man straightened up from a plotting board.

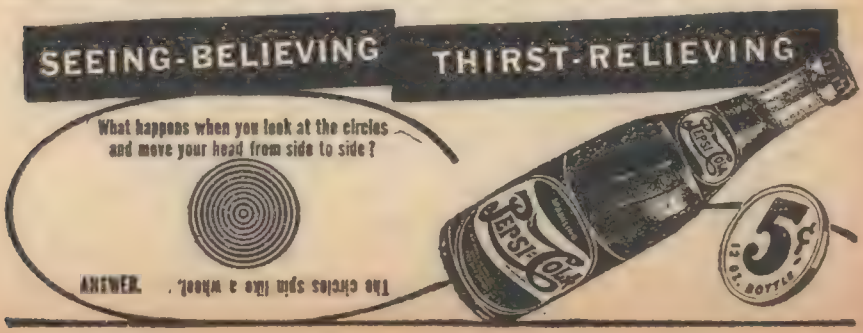
"That does it, I think," he said. "He was using heavy current for a while, probably trying to turn out with his gyros; then there was a flash of S. H. F., and everything stopped. That must have taken out his second-order, and he'd have had to use about sixty gravities of first-order to pull out of that spot. I wonder what he was doing so close to those suns."

"Could have been hiding," suggested a second pilot. "He might have thought the suns would mask most of his radiation. I wonder how he expected to stay there any length of time, though."

"I know what I'd have done in his place," replied the first man. "I'd have put my ship into a Trojan position and waited the business out. He could have lasted indefinitely there. I wonder why he didn't try that."

"He probably did." The speaker was a navigator, who had kept silent up to this point. "If a smart man like you would do it, a fellow like that couldn't be expected to know any better. Have you *ever* seen a planet in the Trojan points of any double sun? I'll bet you haven't. That Trojan solution works fine for Sol and Jupiter—Sol is a thousand times the more massive. It would work for Earth and Luna, since one has about eighty times the mass of the other. But I have never seen a binary star where the mass ratio was anywhere near twenty-five to one; and if it's less, the Trojan solution to the three-body problem doesn't work. Don't ask me why; I couldn't show you the math; but I know it's true—the stability function breaks, with surprising sharpness, right about the twenty-five-to-one mass ratio. Our elusive friend didn't know that, any more than you did, and parked his ship right in the path of a rapidly moving sun." He shrugged his shoulders, and turned away. "Live and learn, they say," he finished, "but the difficulty seems to lie in living while you learn."

THE END.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What happens when you look at the circles and move your head from side to side?
ANSWER. The circles spin like a wheel.
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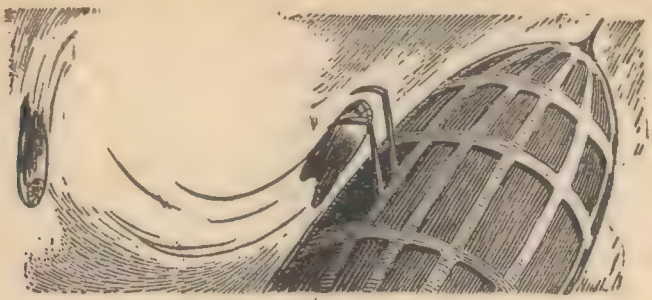
It was a weird sort of battle for survival—not only of individuals, but each, against his will, represented his whole race. And the battle rested on ingenuity, tenacity and courage, not strength alone—



"Arena"

by FREDRIC BROWN

Illustrated by Williams

Carson opened his eyes, and found himself looking upward into a flickering blue dimness.

It was hot, and he was lying on sand, and a sharp rock embedded in the sand was hurting his back. He rolled over to his side, off the rock, and then pushed himself up to a sitting position.

"I'm crazy," he thought. "Crazy—or dead—or something." The sand was blue, bright blue. And there wasn't any such thing as bright blue sand on Earth or any of the planets.

Blue sand.

Blue sand under a blue dome that wasn't the sky nor yet a room, but a circumscribed area—somehow he knew it was circumscribed and finite even though he couldn't see to the top of it.

He picked up some of the sand in his hand and let it run through his fingers. It trickled down onto his bare leg. *Bare?*

Naked. He was stark naked, and already his body was dripping perspiration from the enervating heat, coated blue with sand wherever sand had touched it.

But elsewhere his body was white.

He thought: Then this sand is really blue. If it seemed blue only because of the blue light, then I'd

be blue also. But I'm white, so the sand *is* blue. *Blue sand.* There isn't any blue sand. There isn't any place like this place I'm in.

Sweat was running down in his eyes.

It was hot, hotter than hell. Only hell—the hell of the ancients—was supposed to be red and not blue.

But if this place wasn't hell, what was it? Only Mercury, among the planets, had heat like this and this wasn't Mercury. And Mercury was some four billion miles from—

It came back to him then, where he'd been. In the little one-man scouter, outside the orbit of Pluto, scouting a scant million miles to one side of the Earth Armada drawn up in battle array there to intercept the Outsiders.

That sudden strident nerve-shattering ringing of the alarm bell when the rival scouter—the Outsider ship—had come within range of his detectors—

No one knew who the Outsiders were, what they looked like, from what far galaxy they came, other than that is was in the general direction of the Pleiades.

First, sporadic raids on Earth colonies and outposts. Isolated battles between Earth patrols and small groups of Outsider spaceships; battles sometimes won and sometimes lost, but never to date resulting in the capture of an alien vessel. Nor had any member of a raided colony ever survived to describe the Outsiders who had left the ships, if indeed they had left them.

Not a too-serious menace, at first, for the raids had not been too numerous or destructive. And individually, the ships had proved slightly inferior in armament to the best of Earth's fighters, although somewhat superior in speed and maneuverability. A sufficient edge in speed, in fact, to give the Outsiders their choice of running or fighting, unless surrounded.

Nevertheless, Earth had prepared for serious trouble, for a showdown, building the mightiest armada of all time. It had been waiting now, that armada, for a long time. But now the showdown was coming.

Scouts twenty billion miles out had detected the approach of a mighty fleet—a showdown fleet—of the Outsiders. Those scouts had never come back, but their radiotronic messages had. And now Earth's armada, all ten thousand ships and half-million fighting spacemen, was out there, outside Pluto's orbit, waiting to intercept and battle to the death.

And an even battle it was going to be, judging by the advance reports of the men of the far picket line who had given their lives to report—before they had died—on the size and strength of the alien fleet.

Anybody's battle, with the mastery of the solar system hanging in the balance, on an even chance. A last and *only* chance, for Earth and all her colonies lay at the utter mercy of the Outsiders if they ran that gauntlet—

Oh yes. Bob Carson remembered now.

Not that it explained blue sand

and flickering blueness. But that strident alarming of the bell and his leap for the control panel. His frenzied fumbling as he strapped himself into the seat. The dot in the visiplate that grew larger.

The dryness of his mouth. The awful knowledge that this was *it*. For him, at least, although the main fleets were still out of range of one another.

This, his first taste of battle. Within three seconds or less he'd be victorious, or a charred cinder. Dead.

Three seconds—that's how long a space-battle lasted. Time enough to count to three, slowly, and then you'd won or you were dead. One hit completely took care of a lightly armed and armored little one-man craft like a scouter.

Frantically—as, unconsciously, his dry lips shaped the word "One" —he worked at the controls to keep that growing dot centered on the crossed spiderwebs of the visiplate. His hands doing that, while his right foot hovered over the pedal that would fire the bolt. The single bolt of concentrated hell that had to hit—or else. There wouldn't be time for any second shot.

"Two." He didn't know he'd said that, either. The dot in the visiplate wasn't a dot now. Only a few thousand miles away, it showed up in the magnification of the plate as though it were only a few hundred yards off. It was a sleek, fast little scouter, about the size of his.

And an alien ship, all right.

"Thr—" His foot touched the bolt-release pedal—

And then the Outsider had swerved suddenly and was off the crosshairs. Carson punched keys frantically, to follow.

For a tenth of a second, it was out of the visiplate entirely, and then as the nose of his scouter swung after it, he saw it again, diving straight toward the ground.

The ground?

It was an optical illusion of some sort. It *had* to be, that planet—or whatever it was—that now covered the visiplate. Whatever it was, it couldn't be there. Couldn't possibly. There *wasn't* any planet nearer than Neptune three billion miles away—with Pluto around on the opposite side of the distant pinpoint sun.

His *detectors*! *They* hadn't shown any object of planetary dimensions, even of asteroid dimensions. They still didn't.

So it couldn't be there, that whatever-it-was he was diving into, only a few hundred miles below him.

And in his sudden anxiety to keep from crashing, he forgot even the Outsider ship. He fired the front braking rockets, and even as the sudden change of speed slammed him forward against the seat straps, he fired full right for an emergency turn. Pushed them down and *held* them down, knowing that he needed everything the ship had to keep from crashing and that a turn that sudden would black him out for a moment.

It did black him out.

And that was all. Now he was sitting in hot blue sand, stark naked

but otherwise unhurt. No sign of his spaceship and—for that matter—no sign of *space*. That curve overhead wasn't a sky, whatever else it was.

He scrambled to his feet.

Gravity seemed a little more than Earth-normal. Not much more.

Flat sand stretching away, a few scrawny bushes in clumps here and there. The bushes were blue, too, but in varying shades, some lighter than the blue of the sand, some darker.

Out from under the nearest bush ran a little thing that was like a lizard, except that it had more than four legs. It was blue, too. Bright blue. It saw him and ran back again under the bush.

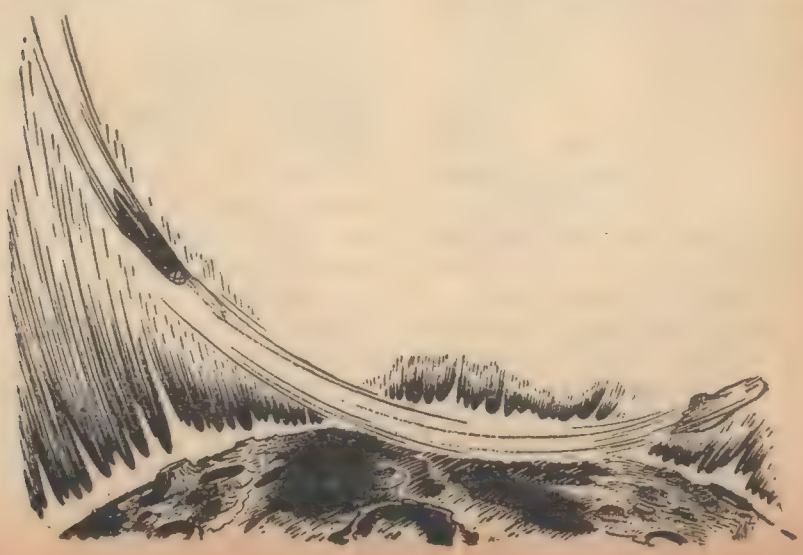
He looked up again, trying to decide what was overhead. It wasn't exactly a roof, but it was dome-shaped. It flickered and was hard to look at. But definitely, it curved down to the ground, to the blue sand, all around him.

He wasn't far from being under the center of the dome. At a guess, it was a hundred yards to the nearest wall, if it was a wall. It was as though a blue hemisphere of *something*, about two hundred and fifty yards in circumference, was inverted over the flat expanse of the sand.

And everything blue, except one object. Over near a far curving wall there was a red object. Roughly spherical, it seemed to be about a yard in diameter. Too far for him to see clearly through the flickering blueness. But, unaccountably, he shuddered.

He wiped sweat from his forehead, or tried to, with the back of his hand.

Was this a dream, a nightmare? This heat, this sand, that vague feeling of horror he felt when he



looked toward that red thing?

A dream? No, one didn't go to sleep and dream in the midst of a battle in space.

Death? No, never. If there were immortality, it wouldn't be a senseless thing like this, a thing of blue heat and blue sand and a red horror.

Then he heard the voice—

Inside his head he heard it, not with his ears. It came from nowhere or everywhere.

"Through spaces and dimensions wandering," rang the words in his mind, *"and in this space and this time I find two peoples about to wage a war that would exterminate one and so weaken the other that it would retrogress and never fulfill its destiny, but decay and return to mindless dust whence it came. And I say this must not happen."*

"Who . . . what are you?" Carson didn't say it aloud, but the question formed itself in his brain.

"You would not understand completely. I am—" There was a pause as though the voice sought—in Carson's brain—for a word that wasn't there, a word he didn't know. *"I am the end of evolution of a race so old the time can not be expressed in words that have meaning to your mind. A race fused into a single entity, eternal—*

"An entity such as your primitive race might become"—again the groping for a word—*"time from now. So might the race you call, in your mind, the Outsiders. So I intervene in the battle to come, the battle between fleets so evenly matched that destruction of both races will result. One must survive. One must progress and evolve."*

"One?" thought Carson. "Mine, or—?"

"It is in my power to stop the war, to send the Outsiders back to their galaxy. But they would return, or your race would sooner or later follow them there. Only by remaining in this space and time to intervene constantly could I prevent them from destroying one another, and I cannot remain.

"So I shall intervene now. I shall destroy one fleet completely without loss to the other. One civilization shall thus survive."

Nightmare. This had to be nightmare, Carson thought. But he knew it wasn't.

It was too mad, too impossible, to be anything but real.

He didn't dare ask *the* question *—which?* But his thoughts asked it for him.

"The stronger shall survive," said the voice. *"That I can not—and would not—change. I merely intervene to make it a complete victory, not"*—groping again—*"not Pyrrhic victory to a broken race.*

"From the outskirts of the not-yet battle I plucked two individuals, you and an Outsider. I see from your mind that in your early history of nationalisms battles between champions, to decide issues between races, were not unknown.

"You and your opponent are here pitted against one another, naked and unarmed, under conditions equally unfamiliar to you both, equally unpleasant to you both. There is no time limit, for here

there is no time. The survivor is the champion of his race. That race survives."

"But—" Carson's protest was too inarticulate for expression, but the voice answered it.

"It is fair. The conditions are such that the accident of physical strength will not completely decide the issue. There is a barrier. You will understand. Brain-power and courage will be more important than strength. Most especially courage, which is the will to survive."

"But while this goes on, the fleets will—"

"No, you are in another space, another time. For as long as you are here, time stands still in the universe you know. I see you wonder whether this place is real. It is, and it is not. As I—to your limited understanding—am and am not real. My existence is mental and not physical. You saw me as a planet; it could have been as a dust-mote or a sun.

"But to you this place is now real. What you suffer here will be real. And if you die here, your death will be real. If you die, your failure will be the end of your race. That is enough for you to know."

And then the voice was gone.

Again he was alone, but not alone. For as Carson looked up, he saw that the red thing, the red sphere of horror which he now knew was the Outsider, was rolling toward him.

Rolling.

It seemed to have no legs or arms that he could see, no features. It rolled across the blue sand with the fluid quickness of a drop of mercury. And before it, in some manner he could not understand, came a paralyzing wave of nauseating, retching, horrid hatred.

Carson looked about him frantically. A stone, lying in the sand a few feet away, was the nearest thing to a weapon. It wasn't large, but it had sharp edges, like a slab of flint. It looked a bit like blue flint.

He picked it up, and crouched to receive the attack. It was coming fast, faster than he could run.

No time to think out how he was going to fight it, and how anyway could he plan to battle a creature whose strength, whose characteristics, whose method of fighting he did not know? Rolling so fast, it looked more than ever like a perfect sphere.

Ten yards away. Five. And then it stopped.

Rather, it *was stopped.* Abruptly the near side of it flattened as though it had run up against an invisible wall. It bounced, actually bounced back.

Then it rolled forward again, but more slowly, more cautiously. It stopped again, at the same place. It tried again, a few yards to one side.

There was a barrier there of some sort. It clicked, then, in Carson's mind. That thought projected into his mind by the Entity who had brought them there: "—accident of physical strength will not completely decide the issue. There is a barrier."

A force-field, of course. Not the Netzian Field, known to Earth

science, for that glowed and emitted a crackling sound. This one was invisible, silent.

It was a wall that ran from side to side of the inverted hemisphere; Carson didn't have to verify that himself. The Roller was doing that; rolling sideways along the barrier, seeking a break in it that wasn't there.

Carson took half a dozen steps forward, his left hand groping out before him, and then his hand touched the barrier. It felt smooth, yielding, like a sheet of rubber rather than like glass. Warm to his touch, but no warmer than the sand underfoot. And it was completely invisible, even at close range.

He dropped the stone and put both hands against it, pushing. It seemed to yield, just a trifle. But no farther than that trifle, even when he pushed with all his weight. It felt like a sheet of rubber backed up by steel. Limited resiliency, and then firm strength.

He stood on tiptoe and reached as high as he could and the barrier was still there.

He saw the Roller coming back, having reached one side of the arena. That feeling of nausea hit Carson again, and he stepped back from the barrier as it went by. It didn't stop.

But did the barrier stop at ground level? Carson knelt down and burrowed in the sand. It was soft, light, easy to dig in. At two feet down the barrier was still there.

The Roller was coming back again. Obviously, it couldn't find a way through at either side.

There must be a way through, Carson thought. *Some* way we can get at each other, else this duel is meaningless.

But no hurry now, in finding that out. There was something to try first. The Roller was back now, and it stopped just across the barrier, only six feet away. It seemed to be studying him, although for the life of him, Carson couldn't find external evidence of sense organs on the thing. Nothing that looked like eyes or ears, or even a mouth. There was though, he saw now, a series of grooves—perhaps a dozen of them altogether, and he saw two tentacles suddenly push out from two of the grooves and dip into the sand as though testing its consistency. Tentacles about an inch in diameter and perhaps a foot and a half long.

But the tentacles were retractable into the grooves and were kept there except when not in use. They were retracted when the thing rolled and seemed to have nothing to do with its method of locomotion. That, as far as Carson could judge, seemed to be accomplished by some shifting—just *how* he couldn't even imagine—of its center of gravity.

He shuddered as he looked at the thing. It was alien, utterly alien, horribly different from anything on Earth or any of the life forms found on the other solar planets. Instinctively, somehow, he knew its mind was as alien as its body.

But he had to try. If it had no

telepathic powers at all, the attempt was foredoomed to failure, yet he thought it had such powers. There had, at any rate, been a projection of something that was not physical at the time a few minutes ago when it had first started for him. An almost tangible wave of hatred.

If it could project that, perhaps it could read his mind as well, sufficiently for his purpose.

Deliberately, Carson picked up the rock that had been his only weapon, then tossed it down again in a gesture of relinquishment and raised his empty hands, palms up, before him.

He spoke aloud, knowing that although the words would be meaningless to the creature before him, speaking them would focus his own thoughts more completely upon the message.

"Can we not have peace between us?" he said, his voice sounding strange in the utter stillness. "The Entity who brought us here has told us what must happen if our races fight—extinction of one and weakening and retrogression of the other. The battle between them, said the Entity, depends upon what we do here. Why can not we agree to an eternal peace—your race to its galaxy, we to ours?"

Carson blanked out his mind to receive a reply.

It came, and it staggered him back, physically. He actually recoiled several steps in sheer horror at the depth and intensity of the hatred and lust-to-kill of the red images that had been projected at him. Not as articulate words—as had come to him the thoughts of the Entity—but as wave upon wave of fierce emotion.

For a moment that seemed an eternity he had to struggle against the mental impact of that hatred, fight to clear his mind of it and drive out the alien thoughts to

which he had given admittance by blanking his own thoughts. He wanted to retch.

Slowly his mind cleared as, slowly, the mind of a man wakening from nightmare clears away the fear-fabric of which the dream was woven. He was breathing hard and he felt weaker, but he could think.

He stood studying the Roller. It had been motionless during the mental duel it had so nearly won. Now it rolled a few feet to one side, to the nearest of the blue bushes. Three tentacles whipped out of their grooves and began to investigate the bush.

"O. K.," Carson said, "so it's war then." He managed a wry grin. "If I got your answer straight, peace doesn't appeal to you." And, because he was, after all, a quite young man and couldn't resist the impluse to be dramatic, he added. "To the death!"

But his voice, in that utter silence, sounded very silly, even to himself. It came to him, then, that this *was* to the death. Not only his own death or that of the red sphercial thing which he now thought of as the Roller, but death to the entire race of one or the other of them. The end of the human race, if he failed.

It made him suddenly very humble and very afraid to think that. More than to think it, to *know* it. Somehow, with a knowledge that was above even faith, he knew that the Entity who had arranged this duel had told the truth about its intentions and its powers. It wasn't kidding.

The future of humanity depended upon *him*. It was an awful thing to realize, and he wrenched his mind away from it. He had to concentrate on the situation at hand.

There had to be some way of getting through the barrier, or of killing through the barrier.

Mentally? He hoped that wasn't all, for the Roller obviously had stronger telepathic powers than the primitive, undeveloped ones of the human race. Or did it?

He had been able to drive the thoughts of the Roller out of his own mind; could it drive out his? If its ability to project were stronger, might not its receptivity mechanism be more vulnerable?

He stared at it and endeavored to concentrate and focus all his thoughts upon it.

"*Die,*" he thought. "*You are going to die. You are dying. You are—*"

He tried variations on it, and mental pictures. Sweat stood out on his forehead and he found himself trembling with the intensity of the effort. But the Roller went ahead with its investigation of the bush, as utterly unaffected as though Carson had been reciting the multiplication table.

So *that* was no good.

He felt a bit weak and dizzy from the heat and his strenuous effort at concentration. He sat down on the blue sand to rest and gave his full attention to watching and studying the Roller. By close study, perhaps, he could judge its

strength and detect its weaknesses, learn things that would be valuable to know when and if they should come to grips.

It was breaking off twigs. Carson watched carefully, trying to judge just how hard it worked to do that. Later, he thought, he could find a similar bush on his own side, break off twigs of equal thickness himself, and gain a comparision of physical strength between his own arms and hands and those tentacles.

The twigs broke off hard; the Roller was having to struggle with each one, he saw. Each tentacle, he saw, bifurcated at the tip into two fingers, each tipped by a nail or claw. The claws didn't seem to be particularly long or dangerous. No more so than his own fingernails, if they were let to grow a bit.

No, on the whole, it didn't look too tough to handle physically. Unless, of course, that bush was made of pretty tough stuff. Carson looked around him and, yes, right within reach was another bush of indentically the same type.

He reached over and snapped off a twig. It was brittle, easy to break. Of course, the Roller might have been faking deliberately but he didn't think so.

On the other hand, where was it vulnerable? Just how would he go about killing it, if he got the chance? He went back to studying it. The outer hide looked pretty tough. He'd need a sharp weapon of some sort. He picked up the piece of rock again. It was about twelve inches long, narrow, and fairly sharp on one end. If it chipped like flint, he could make a serviceable knife out of it.

The Roller was continuing its investigations of the bushes. It rolled again, to the nearest one of another type. A little blue lizard, many-legged like the one Carson had seen on his side of the barrier, darted out from under the bush.

A tentacle of the Roller lashed out and caught it, picked it up. Another tentacle whipped over and began to pull legs off the lizard, as coldly and calmly as it had pulled twigs off the bush. The creature struggled frantically and emitted a shrill squealing sound that was the first sound Carson had heard here other than the sound of his own voice.

Carson shuddered and wanted to turn his eyes away. But he made himself continue to watch; anything he could learn about his opponent might prove valuable. Even this knowledge of its unnecessary cruelty. Particularly, he thought with a sudden vicious surge of emotion, this knowledge of its unnecessary cruelty. It would make it a pleasure to kill the thing, if and when the chance came.

He steeled himself to watch the dismembering of the lizard, for that very reason.

But he felt glad when, with half its legs gone, the lizard quit squealing and struggling and lay limp and dead in the Roller's grasp.

It didn't continue with the rest of the legs. Contemptuously it tossed the dead lizard away from it, in Carson's direction. It arced through

the air between them and landed at his feet.

It had come through the barrier! The barrier wasn't there any more!

Carson was on his feet in a flash, the knife gripped tightly in his hand, and leaped forward. He'd settle this thing here and now! With the barrier gone—

But it wasn't gone. He found that out the hard way, running head on into it and nearly knocking himself silly. He bounced back, and fell.

And as he sat up, shaking his head to clear it, he saw something coming through the air toward him, and to duck it, he threw himself flat again on the sand, and to one side. He got his body out of the way, but there was a sudden sharp pain in the calf of his left leg.

He rolled backward, ignoring the pain, and scrambled to his feet. It was a rock, he saw now, that had struck him. And the Roller was picking up another one now, swinging it back gripped between two tentacles, getting ready to throw again.

It sailed through the air toward him, but he was easily able to step out of its way. The Roller, apparently, could throw straight, but not hard nor far. The first rock had struck him only because he had been sitting down and had not seen it coming until it was almost upon him.

Even as he stepped aside from that weak second throw, Carson drew back his right arm and let fly with the rock that was still in his hand. If missiles, he thought with sudden elation, can cross the barrier, then two can play at the game of throwing them. And the good right arm of an Earthman—

He couldn't miss a three-foot sphere at only four-yard range, and he didn't miss. The rock whizzed straight, and with a speed several times that of the missiles the Roller had thrown. It hit dead center, but it hit flat, unfortunately, instead of point first.

But it hit with a resounding thump, and obviously it hurt. The Roller had been reaching for another rock, but it changed its mind and got out of there instead. By the time Carson could pick up and throw another rock, the Roller was forty yards back from the barrier and going strong.

His second throw missed by feet, and his third throw was short. The Roller was back out of range—at least out of range of a missile heavy enough to be damaging.

Carson grinned. That round had been his. Except—

He quit grinning as he bent over to examine the calf of his leg. A jagged edge of the stone had made a pretty deep cut, several inches long. It was bleeding pretty freely, but he didn't think it had gone deep enough to hit an artery. If it stopped bleeding of its own accord, well and good. If not, he was in for trouble.

Finding out one thing, though, took precedence over that cut. The nature of the barrier.

He went forward to it again, this time groping with his hands

before him. He found it; then holding one hand against it, he tossed a handful of sand at it with the other hand. The sand went right through. His hand didn't.

Organic matter versus inorganic? No, because the dead lizard had gone through it, and a lizard, alive or dead, was certainly organic. Plant life? He broke off a twig and poked it at the barrier. The twig went through, with no resistance, but when his fingers gripping the twig came to the barrier, they were stopped.

He couldn't get through it, nor could the Roller. But rocks and sand and a dead lizard—

How about a live lizard? He went hunting, under bushes, until he found one, and caught it. He tossed it gently against the barrier and it bounced back and scurried away across the blue sand.

That gave him the answer, in so far as he could determine it now. The screen was a barrier to living things. Dead or inorganic matter could cross it.

That off his mind, Carson looked at his injured leg again. The bleeding was lessening, which meant he wouldn't need to worry about making a tourniquet. But he should find some water, if any was available, to clean the wound.

Water—the thought of it made him realize that he was getting awfully thirsty. He'd *have* to find water, in case this contest turned out to be a protracted one.

Limping slightly now, he started off to make a full circuit of his half of the arena. Guiding himself with one hand along the barrier, he walked to his right until he came to the curving sidewall. It was visible, a dull blue-gray at close range, and the surface of it felt just like the central barrier.

He experimented by tossing a

handful of sand at it, and the sand reached the wall and disappeared as it went through. The hemispherical shell was a force-field, too. But an opaque one, instead of transparent like the barrier.

He followed it around until he came back to the barrier, and walked back along the barrier to the point from which he'd started.

No sign of water.

Worried now, he started a series of zigzags back and forth between the barrier and the wall, covering the intervening space thoroughly.

No water. Blue sand, blue bushes, and intolerable heat. Nothing else.

It must be his imagination, he told himself angrily, that he was suffering *that* much from thirst. How long had he been here? Of course, no time at all, according to his own space-time frame. The Entity had told him time stood still out there, while he was here. But his body processes went on here, just the same. And according to his body's reckoning, how long had he been here? Three or four hours, perhaps. Certainly not long enough to be suffering seriously from thirst.

But he was suffering from it; his throat dry and parched. Probably the intense heat was the cause. It was *hot!* A hundred and thirty Fahrenheit, at a guess. A dry, still heat without the slightest movement of air.

He was limping rather badly, and utterly fagged out when he'd finished the futile exploration of his domain.

He stared across at the motionless Roller and hoped it was as miserable as he was. And quite possibly it wasn't enjoying this, either. The Entity had said the conditions here were equally unfamiliar and equally uncomfortable for both of them. Maybe the Roller came from a planet where two-hundred degree heat was the norm. Maybe it was freezing while he was roasting.

Maybe the air was as much too thick for it as it was too thin for him. For the exertion of his explorations had left him panting. The atmosphere here, he realized now, was not much thicker than that on Mars.

No water.

That meant a deadline, for him at any rate. Unless he could find a way to cross that barrier or to kill his enemy from this side of it, thirst would kill him, eventually.

It gave him a feeling of desperate urgency. He *must* hurry.

But he made himself sit down a moment to rest, to think.

What was there to do? Nothing, and yet so many things. The several varieties of bushes, for example. They didn't look promising, but he'd have to examine them for possibilities. And his leg—he'd have to do something about that, even without water to clean it. Gather ammunition in the form of rocks. Find a rock that would make a good knife.

His leg hurt rather badly now, and he decided that came first. One type of bush had leaves—or things rather similar to leaves. He pulled off a handful of them and decided,

after examination, to take a chance on them. He used them to clean off the sand and dirt and caked blood, then made a pad of fresh leaves and tied it over the wound with tendrils from the same bush.

The tendrils proved unexpectedly tough and strong. They were slender, and soft and pliable, yet he couldn't break them at all. He had to saw them off the bush with the sharp edge of a piece of the blue flint. Some of the thicker ones were over a foot long, and he filed away in his memory, for future reference, the fact that a bunch of the thick ones, tied together, would make a pretty serviceable rope. Maybe he'd be able to think of a use for rope.

Next, he made himself a knife. The blue flint *did* chip. From a foot-long splinter of it, he fashioned himself a crude but lethal weapon. And of tendrils from the bush, he made himself a rope-belt through which he could thrust the flint knife, to keep it with him all the time and yet have his hands free.

He went back to studying the bushes. There were three other types. One was leafless, dry, brittle, rather like a dried tumbleweed. Another was of soft, crumbly wood, almost like punk. It looked and felt as though it would make excellent tinder for a fire. The third type was the most nearly woodlike. It had fragile leaves that wilted at a touch, but the stalks, although short, were straight and strong.

It was horribly, unbearably hot.

He limped up to the barrier, felt to make sure that it was still there. It was.

He stood watching the Roller for a while. It was keeping a safe distance back from the barrier, out of effective stone-throwing range. It was moving around back there, doing something. He couldn't tell what it was doing.

Once it stopped moving, came a little closer, and seemed to concentrate its attention on him. Again Carson had to fight off a wave of nausea. He threw a stone at it and the Roller retreated and went back to whatever it had been doing before.

At least he could make it keep its distance.

And, he thought bitterly, a devil of a lot of good *that* did him. Just the same, he spent the next hour or two gathering stones of suitable size for throwing, and making several neat piles of them, near his side of the barrier.

His throat burned now. It was difficult for him to think about anything except water.

But he *had* to think about other things. About getting through that barrier, under or over it, getting *at* that red sphere and killing it before this place of heat and thirst killed him first.

The barrier went to the wall upon either side, but how high and how far under the sand?

For just a moment, Carson's mind was too fuzzy to think out how he could find out either of those things. Idly, sitting there in the hot sand—and he didn't remember sitting down—he watched

a blue lizard crawl from the shelter of one bush to the shelter of another.

From under the second bush, it looked out at him.

Carson grinned at it. Maybe he was getting a bit punch-drunk, because he remembered suddenly the old story of the desert-colonists on Mars, taken from an older desert story of Earth— "Pretty soon you get so lonesome you find yourself talking to the lizards, and then not so long after that you find the lizards talking back to you—"

He should have been concentrating, of course, on how to kill the Roller, but instead he grinned at the lizard and said, "Hello, there."

The lizard took a few steps toward him. "Hello," it said.

Carson was stunned for a moment, and then he put back his head and roared with laughter. It didn't hurt his throat to do so, either; he hadn't been *that* thirsty.

Why not? Why should the Entity who thought up this nightmare of a place not have a sense of humor, along with the other powers he has? Talking lizards, equipped to talk back in my own language, if I talk to them— It's a nice touch.

He grinned at the lizard and said, "Come on over." But the lizard turned and ran away, scurrying from bush to bush until it was out of sight.

He was thirsty again.

And he had to *do* something. He couldn't win this contest by sitting here sweating and feeling miserable. He had to *do* something. But what?

Get through the barrier. But he couldn't get through it, or over it. But was he certain he couldn't get under it? And come to think of it, didn't one sometimes find water by digging? Two birds with one stone—

Painfully now, Carson limped up to the barrier and started digging, scooping up sand a double handful at a time. It was slow, hard work because the sand ran in at the edges and the deeper he got the bigger in diameter the hole had to be. How many hours it took him, he didn't know, but he hit bedrock four feet down. Dry bedrock; no sign of water.

And the force-field of the barrier went down clear to the bedrock. No dice. No water. Nothing.

He crawled out of the hole and lay there panting, and then raised his head to look across and see what the Roller was doing. It must be doing something back there.

It was. It was making something out of wood from the bushes, tied together with tendrils. A queerly shaped framework about four feet high and roughly square. To see it better, Carson climbed up onto the mound of sand he had excavated from the hole, and stood there staring.

There were two long levers sticking out of the back of it, one with a cup-shaped affair on the end of it. Seemed to be some sort of a catapult, Carson thought.

Sure enough, the Roller was lifting a sizable rock into the cup-

shaped outfit. One of his tentacles moved the other lever up and down for a while, and then he turned the machine slightly as though aiming it and the lever with the stone flew up and forward.

The stone arced several yards over Carson's head, so far away that he didn't have to duck, but he judged the distance it had traveled, and whistled softly. He couldn't throw a rock that weight more than half that distance. And even retreating to the rear of his domain wouldn't put him out of range of that machine, if the Roller shoved it forward almost to the barrier.

Another rock whizzed over. Not quite so far away this time.

That thing could be dangerous, he decided. Maybe he'd better do something about it.

Moving from side to side along the barrier, so the catapult couldn't bracket him, he whaled a dozen rocks at it. But that wasn't going to be any good, he saw. They had to be light rocks, or he couldn't throw them that far. If they hit the framework, they bounced off harmlessly. And the Roller had no difficulty, at that distance, in moving aside from those that came near it.

Besides, his arm was tiring badly. He ached all over from sheer weariness. If he could only rest a while without having to duck rocks from that catapult at regular intervals of maybe thirty seconds each—

He stumbled back to the rear of the arena. Then he saw even that wasn't any good. The rocks reached back there, too, only there were longer intervals between them,

as though it took longer to wind up the mechanism, whatever it was, of the catapult.

Wearily he dragged himself back to the barrier again. Several times he fell and could barely rise to his feet to go on. He was, he knew, near the limit of his endurance. Yet he didn't dare stop moving now, until and unless he could put that catapult out of action. If he fell asleep, he'd never wake up.

One of the stones from it gave him the first glimmer of an idea. It struck upon one of the piles of stones he'd gathered together near the barrier to use as ammunition, and it struck sparks.

Sparks. Fire. Primitive man had made fire by striking sparks, and with some of those dry crumbly bushes as tinder—

Luckily, a bush of that type was near him. He broke it off, took it over to the pile of stones, then patiently hit one stone against another until a spark touched the punklike wood of the bush. It went up in flames so fast that it singed his eyebrows and was burned to an ash within seconds.

But he had the idea now, and within minutes he had a little fire going in the lee of the mound of sand he'd made digging the hole an hour or two ago. Tinder bushes had started it, and other bushes which burned, but more slowly, kept it a steady flame.

The tough wirelike tendrils didn't burn readily; that made the fire-bombs easy to make and throw. A bundle of faggots tied about a small stone to give it weight and a loop of the tendril to swing it by.

He made half a dozen of them before he lighted and threw the first. It went wide, and the Roller started a quick retreat, pulling the catapult after him. But Carson had the others ready and threw them in rapid succession. The fourth wedged in the catapult's frame work, and did the trick. The Roller tried desperately to put out the spreading blaze by throwing sand, but its clawed tentacles would take only a spoonful at a time and his efforts were ineffectual. The catapult burned.

The Roller moved safely away from the fire and seemed to concentrate its attention on Carson and again he felt that wave of hatred and nausea. But more weakly; either the Roller itself was weakening or Carson had learned how to protect himself against the mental attack.

He thumbed his nose at it and then sent it scuttling back to safety by throwing a stone. The Roller went clear to the back of its half of the arena and started pulling up bushes again. Probably it was going to make another catapult.

Carson verified—for the hundredth time—that the barrier was still operating, and then found himself sitting in the sand beside it because he was suddenly too weak to stand up.

His leg throbbed steadily now and the pangs of thirst were severe. But those things paled beside the utter physical exhaustion that gripped his entire body.

And the heat.

Hell must be like this, he thought. The hell that the ancients had believed in. He fought to stay awake, and yet staying awake seemed futile, for there was nothing he could do. Nothing, while the barrier remained impregnable and the Roller stayed back out of range.

But there must be *something*. He tried to remember things he had read in books of archaeology about the methods of fighting used back in the days before metal and plastic. The stone missile, that had come first, he thought. Well, that he already had.

The only improvement on it would be a catapult, such as the Roller had made. But he'd never be able to make one, with the tiny bits of wood available from the bushes—no single piece longer than a foot or so. Certainly he could figure out a mechanism for one, but he didn't have the endurance left for a task that would take days.

Days? But the Roller had made one. Had they been here days already? Then he remembered that the Roller had many tentacles to work with and undoubtedly could do such work faster than he.

And besides, a catapult wouldn't decide the issue. He had to do better than that.

Bow and arrow? No; he'd tried archery once and knew his own ineptness with a bow. Even with a modern sportsman's durasteel weapon, made for accuracy. With such a crude, pieced-together outfit as he could make here, he doubted if he could shoot as far as he could throw a rock, and knew he couldn't shoot as straight.

Spear? Well, he *could* make that. It would be useless as a throwing weapon at any distance, but would be a handy thing at close range, if he ever got to close range.

And making one would give him something to do. Help keep his mind from wandering, as it was beginning to do. Sometimes now, he had to concentrate a while before he could remember why he was here, why he had to kill the Roller.

Luckily he was still beside one of the piles of stones. He sorted through it until he found one shaped roughly like a spearhead. With a smaller stone he began to chip it into shape, fashioning sharp shoulders on the sides so that if it penetrated it would not pull out again.

Like a harpoon? There was something in that idea, he thought. A harpoon was better than a spear, maybe, for this crazy contest. If he could once get it into the Roller, and had a rope on it, he could pull the Roller up against the barrier and the stone blade of his knife would reach through that barrier, even if his hands wouldn't.

The shaft was harder to make than the head. But by splitting and joining the main stems of four of the bushes, and wrapping the joints with the tough but thin tendrils, he got a strong shaft about four feet long, and tied the stone head in a notch cut in the end.

It was crude, but strong.

And the rope. With the thin tough tendrils he made himself twenty feet of line. It was light and didn't look strong, but he knew it would hold his weight and to spare. He tied one end of it to the shaft of the harpoon and the other end about his right wrist. At least, if he threw his harpoon across the barrier, he'd be able to pull it back if he missed.

Then when he had tied the last knot and there was nothing more he could do, the heat and the weariness and the pain in his leg and the dreadful thirst were suddenly a thousand times worse than they had been before.

He tried to stand up, to see what the Roller was doing now, and found he couldn't get to his feet. On the third try, he got as far as his knees and then fell flat again.

"I've got to sleep," he thought. "If a showdown came now, I'd be helpless. He could come up here and kill me, if he knew. I've got to regain some strength."

Slowly, painfully, he crawled back away from the barrier. Ten yards, twenty—

The jar of something thudding against the sand near him waked him from a confused and horrible dream to a more confused and more horrible reality, and he opened his eyes again to blue radiance over blue sand.

How long had he slept? A minute? A day?

Another stone thudded nearer and threw sand on him. He got his arms under him and sat up. He turned around and saw the Roller twenty yards away, at the barrier.

It rolled away hastily as he sat up, not stopping until it was as far away as it could get.

He'd fallen asleep too soon, he realized, while he was still in range of the Roller's throwing ability. Seeing him lying motionless, it had dared come up to the barrier to throw at him. Luckily, it didn't realize how weak he was, or it could have stayed there and kept on throwing stones.

Had he slept long? He didn't think so, because he felt just as he had before. Not rested at all, no thirstier, no different. Probably he'd been there only a few minutes.

He started crawling again, this time forcing himself to keep going until he was as far as he could go, until the colorless, opaque wall of the arena's outer shell was only a yard away.

Then things slipped away again—

When he awoke, nothing about him was changed, but this time he knew that he had slept a long time.

The first thing he became aware of was the inside of his mouth; it was dry, caked. His tongue was swollen.

Something was wrong, he knew, as he returned slowly to full awareness. He felt less tired, the stage of utter exhaustion had passed. The sleep had taken care of that.

But there was pain, agonizing pain. It wasn't until he tried to move that he knew that it came from his leg.

He raised his head and looked

down at it. It was swollen terribly below the knee and the swelling showed even halfway up his thigh. The plant tendrils he had used to tie on the protective pad of leaves now cut deeply into the swollen flesh.

To get his knife under that imbedded lashing would have been impossible. Fortunately, the final knot was over the shin bone, in front, where the vine cut in less deeply than elsewhere. He was able, after an agonizing effort, to untie the knot.

A look under the pad of leaves told him the worst. Infection and blood poisioning, both pretty bad and getting worse.

And without drugs, without cloth, without even *water*, there wasn't a thing he could do about it.

Not a thing, except *die*, when the poison had spread through his system.

He knew it was hopeless, then, and that he'd lost.

And with him, humanity. When he died here, out there in the universe he knew, all his friends, everybody, would die too. And Earth and the colonized planets would be the home of the red, rolling, alien Outsiders. Creatures out of nightmare, things without a human attribute, who picked lizards apart for the fun of it.

It was the thought of that which gave him courage to start crawling, almost blindly in pain, toward the barrier again. Not crawling on hands and knees this time, but pulling himself along only by his arms and hands.

A chance in a million, that maybe he'd have strength left, when he got there, to throw his harpoon-spear just *once*, and with deadly effect, if —on another chance in a million— the Roller would come up to the barrier. Or if the barrier was gone, now.

It took him years, it seemed, to get there.

The barrier wasn't gone. It was as impassable as when he'd first felt it.

And the Roller wasn't at the barrier. By raising up on his elbows, he could see it at the back of its part of the arena, working on a wooden framework that was a half-completed duplicate of the catapult he'd destroyed.

It was moving slowly now. Undoubtedly it had weakened, too.

But Carson doubted that it would ever need that second catapult. He'd be dead, he thought, before it was finished.

If he could attract it to the barrier, now, while he was still alive— He waved an arm and tried to shout, but his parched throat would make no sound.

Or if he could get through the barrier—

His mind must have slipped for a moment, for he found himself beating his fists against the barrier in futile rage, and made himself stop.

He closed his eyes, tried to make himself calm.

"Hello," said the voice.

It was a small, thin voice. It sounded like—

He opened his eyes and turned his head. It *was* a lizard.

"Go away," Carson wanted to say. "Go away; you're not really there, or you're there but not really talking. I'm imagining things again."

But he couldn't talk; his throat and tongue were past all speech with the dryness. He closed his eyes again.

"Hurt," said the voice. "Kill. Hurt—kill. Come."

He opened his eyes again. The blue ten-legged lizard was still there. It ran a little way along the barrier, came back, started off again, and came back.

"Hurt," it said. "Kill. Come."

Again it started off, and came back. Obviously it wanted Carson to follow it along the barrier.

He closed his eyes again. The voice kept on. The same three meaningless words. Each time he opened his eyes, it ran off and came back.

"Hurt. Kill. Come."

Carson groaned. There would be no peace unless he followed the blasted thing. Like it wanted him to.

He followed it, crawling. Another sound, a high-pitched squealing, came to his ears and grew louder.

There was something lying in the sand, writhing, squealing. Something small, blue, that looked like a lizard and yet didn't—

Then he saw what it was—the lizard whose legs the Roller had pulled off, so long ago. But it wasn't dead; it had come back to life and was wriggling and screaming in agony.

"Hurt," said the other lizard. "Hurt. Kill. Kill."

Carson understood. He took the flint knife from his belt and killed the tortured creature. The live lizard scurried off quickly.

Carson turned back to the barrier. He leaned his hands and head against it and watched the Roller, far back, working on the new catapult.

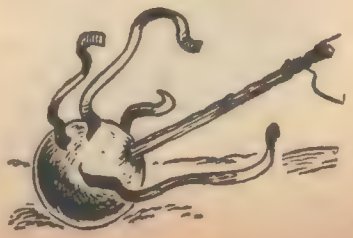
"I could get that far," he thought, "If I could get through. If I could get through, I might win yet. It looks weak, too. I might—"

And then there was another reaction of black hopelessness, when pain sapped his will and he wished that he were dead. He envied the lizard he'd just killed. It didn't have to live on and suffer. And he did. It would be hours, it might be days, before the blood poisoning killed him.

If only he could use that knife on himself—

But he knew he wouldn't. As long as he was alive, there was the millionth chance—.

He was straining, pushing on the



barrier with the flat of his hands, and he noticed his arms, how thin and scrawny they were now. He must really have been here a long time, for days, to get as thin as that.

How much longer now, before he died? How much more heat and thirst and pain could flesh stand?

For a little while he was almost hysterical again, and then came a time of deep calm, and a thought that was startling.

The lizard he had just killed. *It had crossed the barrier, still alive.* It had come from the Roller's side; the Roller had pulled off its legs and then tossed it contemptuously at him and it had come through the barrier. He'd thought, because the lizard was dead.

But it hadn't been dead; it had been unconscious.

A live lizard couldn't go through the barrier, but an unconscious one could. The barrier was not a barrier, then, to living flesh, but to conscious flesh. It was a *mental* projection, a *mental* hazard.

And with that thought, Carson started crawling along the barrier to make his last desperate gamble. A hope so forlorn that only a dying man would have dared try it.

No use weighing the odds of success. Not when, if he didn't try it, those odds were infinitely to zero.

He crawled along the barrier to the dune of sand, about four feet high, which he'd scooped out in trying—how many days ago?—to dig under the barrier or to reach water.

That mound was right at the barrier, its farther slope half on one side of the barrier, half on the other.

Taking with him a rock from the pile nearby, he climbed up to the top of the dune and over the top, and lay there against the barrier, his weight leaning against it so that if the barrier were taken away he'd roll on down the short slope, into the enemy territory.

He checked to be sure that the knife was safely in his rope belt, that the harpoon was in the crook of his left arm and that the twenty-foot rope fastened to it and to his wrist.

Then with his right hand he raised the rock with which he would

hit himself on the head. Luck would have to be with him on that blow; it would have to be hard enough to knock him out, but not hard enough to knock him out for long.

He had a hunch that the Roller was watching him, and would see him roll down through the barrier, and come to investigate. It would think he was dead, he hoped—he thought it had probably drawn the same deduction about the nature of the barrier that he had drawn. But it would come cautiously. He would have a little time—

He struck.

Pain brought him back to consciousness. A sudden, sharp pain in his hip that was different from the throbbing pain in his head and the throbbing pain in his leg.

But he had, thinking things out before he had struck himself, anticipated that very pain, even hoped for it, and had steeled himself against awakening with a sudden movement.

He lay still, but opened his eyes just a slit, and saw that he had guessed rightly. The Roller was coming closer. It was twenty feet away and the pain that had awakened him was the stone it had tossed to see whether he was alive or dead.

He lay still. It came closer, fifteen feet away, and stopped again. Carson scarcely breathed.

As nearly as possible, he was keeping his mind a blank, lest its telepathic ability detect consciousness in him. And with his mind blanked out that way, the impact of its thoughts upon his mind was nearly soul-shattering.

He felt sheer horror at the utter *alienness*, the *differentness* of those thoughts. Things that he felt but could not understand and could never express, because no terrestrial language had words, no terrestrial mind had images to fit them. The mind of a spider, he thought, or the mind of a praying mantis—or a Martian sand-serpent, raised to intelligence and put in telepathic rapport with human minds, would be a homely familiar thing, compared to this.

He understood now that the Entity had been right: Man or Roller, and the universe was not a place that could hold them both. Farther apart than god and devil, there could never be even a balance between them.

Closer. Carson waited until it was only feet away, until its clawed tentacles reached out—

Oblivious to agony now, he sat up, raised and flung the harpoon with all the strength that remained to him. Or he thought it was all; sudden final strength flooded through him, along with a sudden forgetfulness of pain as definite as a nerve block.

As the Roller, deeply stabbed by the harpoon, rolled away, Carson tried to get to his feet to run after it. He couldn't do that; he fell, but kept crawling.

It reached the end of the rope, and he was jerked forward by the pull on his wrist. It dragged him a few feet and then stopped. Carson kept on going, pulling himself

toward it hand over hand along the rope.

It stopped there, writhing tentacles trying in vain to pull out the harpoon. It seemed to shudder and quiver, and then it must have realized that it couldn't get away, for it rolled back toward him, clawed tentacles reaching out.

Stone knife in hand, he met it. He stabbed, again and again, while those horrid claws ripped skin and flesh and muscle from his body.

He stabbed and slashed, and at last it was still.

A bell was ringing, and it took him a while after he'd opened his eyes to tell where he was and what it was. He was strapped into the seat of his scouter, and the visiplate before him showed only empty space. No Outsider ship and no impossible planet.

The bell was the communications plate signal; someone wanted him to switch power into the receiver. Purely reflex action enabled him to reach forward and throw the lever.

The face of Brander, captain of the *Magellan*, mother-ship of his group of scouters, flashed into the screen. His face was pale and his black eyes glowing with excitement.

"*Magellan* to Carson," he snapped. "Come on in. The fight's over. We've won!"

The screen went blank; Brander would be signaling the other scouters of his command.

Slowly, Carson set the controls for the return. Slowly, unbelievingly, he unstrapped himself from the seat and went back to get a drink at the cold-water tank. For some reason, he was unbelievably thirsty. He drank six glasses.

He leaned there against the wall, trying to think.

Had it happened? He was in good health, sound, uninjured. His thirst had been mental rather than physical; his throat hadn't been dry. His leg—

He pulled up his trouser leg and looked at the calf. There was a long white scar there, but a perfectly healed scar. It hadn't been there before. He zipped open the front of his shirt and saw that his chest and abdomen were crisscrossed with tiny, almost unnotice-

TEST SIGHT
TASTE RIGHT
If the ladder is placed against building, how far up will it reach?
ANSWER.
It will reach exactly to the top of the building.
PEPSI-COLA
5¢
TO 12 OZ. BOTTLE

able, perfectly healed scars.

It *had* happened.

The scouter, under automatic control, was already entering the hatch of the mother-ship. The grapples pulled it into its individual lock, and a moment later a buzzer indicated that the lock was air-filled. Carson opened the hatch and stepped outside, went through the double door of the lock.

He went right to Brander's office, went in, and saluted.

Brander still looked dizzily dazed. "Hi, Carson," he said. "What you missed! What a show!"

"What happened, sir?"

"Don't know, exactly. We fired one salvo, and their whole fleet went up in dust! Whatever it was jumped from ship to ship in a flash, even the ones we hadn't aimed at and that were out of range! The whole fleet disintegrated before our eyes, and we didn't get the paint of a single ship scratched!

"We can't even claim credit for it. Must have been some unstable component in the metal they used, and our sighting shot just set it off. Man, oh man, too bad you missed all the excitement."

Carson managed to grin. It was a sickly ghost of a grin, for it would be days before he'd be over the mental impact of his experience, but the captain wasn't watching, and didn't notice.

"Yes, sir," he said. Common sense, more than modesty, told him he'd be branded forever as the worst liar in space if he ever said any more than that. "Yes, sir, too bad I missed all the excitement."

THE END.

THE ANALYTICAL LABORATORY

The Lab this issue carries two reports—both delayed. Since the issue date of Astounding has been moved up, and the delayed votes have to be given time to get in, the Lab will regularly run two, instead of one month behind. Sorry—but when certain other conditions improve, maybe we can catch up again!

February Issue

Postion	Story	Author	Points
1.	The Anarch	Malcolm Jameson	1.60
2.	Plague	Murray Leinster	2.60
3.	Though Dreamers Die	Lester del Rey	3.62
4.	Off The Beam	George O. Smith	3.75
5.	Catch That Rabbit	Isaac Asimov	4.64

March Issue

Position	Story	Author	Points
1.	Children's Hour	Lawrence O'Donnell	1.92
2.	The Contract	E. Mayne Hull	2.4
3.	The Rulers	A. E. van Vogt	3.01
4.	Circle of Confusion	Wesley Long	4.15
5.	Controller	Eric Frank Russell	4.95

THE EDITOR

"WITHOUT IT, HE'D BE DEAD RIGHT NOW!"

"One thing saved him. Plasma. So if he gets well, he has *you* to thank. . Housewife Jones, Stevedore Smith, Sophomore Brown!"

And if he didn't get the plasma . . . if he didn't get well . . . would he have *you* to blame? You, who mean to go to the Red Cross blood bank, but never quite get around to it?

Don't give it a chance to happen. Go to your blood bank NOW . . . and win a soldier's undying gratitude—as well as—perhaps—his life!

THE RED CROSS NEEDS *YOUR* BLOOD . . . NOW!

Brass Tacks

There was the U. S. Customs guard who stopped Canadian troops coming to help defend Alaska because they wouldn't pay duty on the rifles!

Dear Mr. Campbell:

I see Murray Leinster is still carrying on his one-man war against "brass hats", "bureaucrats", and "politicians", (Remember "Politics"?) Having known a good many such, I offer a demurrer to some of his more sweeping indictments.

Megalomaniac self-conceit on one hand and buck-passing, precedent-worshiping fear of responsibility on the other do exist. I have seen brass-buttoned arrogance exhibited by a college president, several Army and Navy officers, a publisher, a shipyard foreman, a few of the country's leading engineers and scientists, rich young bounders, policemen, et cetera. No class seems immune to the bite of the authority-bug. But I have not seen any evidence that government officials are more prone to this fault than other people. In fact, I am pleasantly surprised to see what a large proportion of them, despite the temptations of rank, manage to remain modest, industrious, thoroughly decent fellows.

The classical example of the comma-worshipers is perhaps furnished by the official of the Tower of London who in 1588, when Lord Howard of Effingham sent a messenger galloping up from Devon to beg more powder and shot to fight the Armada, replied that nothing could be done until His Lordship furnished an itemized list of his requirements in due form. They haven't changed much. But here again, this kind of behavior is exceptional. Even among the despised governmental bureaucrats you will find plenty of people who, in a pinch, will stick their necks out to help.

Furthermore the megalomaniacs and the buck-passers are seldom the same people, as the two qualities are somewhat mutually exclusive. Nor should these particular faults be considered to inhere especially among professional politicians, another class disliked by Mr. Leinster. The politicians have their faults, but their tendency, far from being a worship of precedent and a too-literal interpretation of laws, is just the opposite: a tendency to make too many exceptions, to bend the rules for their friends and supporters, to be too supple and lacking in rigid principles. At least so I judge from those I've known at first and second hand.

Nor should the characteristic megalomania and neophobia of "officials" be regarded simply as faults, in whose absence everything would be jake. Not at all. An officer completely free of self-conceit would be so modest he'd never accomplish anything, because he'd be ashamed ever to issue an order to somebody who might know more than he. Such people exist, too. And for every spinner of red tape, every literolater, you find one of these ambitious lads who, in his haste to "cut the red tape" and to "get things done regardless" gets his associates so fouled up in cross-purposes and confusion that in the long run much more time is lost than saved. To this class belong the officer who steals other outfits' supplies for his own, when the other outfits are actually more important in the strategic plan; the official who substitutes telephone calls and personal notes for official correspondence, with the result that no record of his work exists and, when he is shifted, a magnificent confusion results; and so on. Perhaps, just to even things up, Mr. Leinster will write us a story about these equally pernicious habits.—Caleb Northrup.

We'll cover the Universe too, when we get a chance!

Dear Mr. Campbell:

Just a few lines from one of the flock that has been world-cruising over the past year, and just returned to find quite a pile of Astounding's waiting to be read.

It was quite a surprise to find that the magazine is going down into the infinite—the November issue having arrived on Christmas Day. I suppose that we must put up with this wartime measure, rather than have nothing at all; but this new small size is certaily handy for the pocket or pack, according to whether in uniform or civilian dress.

You might be interested in knowing that I've found copies of your magazines in the most unexpected places—there were numerous back issues available in Cape Town and Cairo—at fancy prices, too—and for a short spell I was in Damascus, Syria, and was stopped on the main street by a dirty old Arab who was selling clean American magazines, amongst which were two copies of 1942 ASF's. Again, during a storm

in the Mediterranean we came across a derelict hulk, and upon boarding her I found two copies of this year's issues.

Out of the many thousands of Americans that I've met and worked with during the past year, I haven't found so very many that are fantasy enthusiasts, yet, one of the biggest surprises cropped up round a campfire somewhere in Italy not very long ago, when a bunch of us were listening to a news bulletin, and I found that several of the crowd were Astounding readers. You can imagine that we had quite a pleasant evening!—Ted Carnell, 17 Burwash Road, Plumstead SE18, London, England.

Well—in these days of food shortage I can't see why land and labor are wasted on parsnips and spinach.

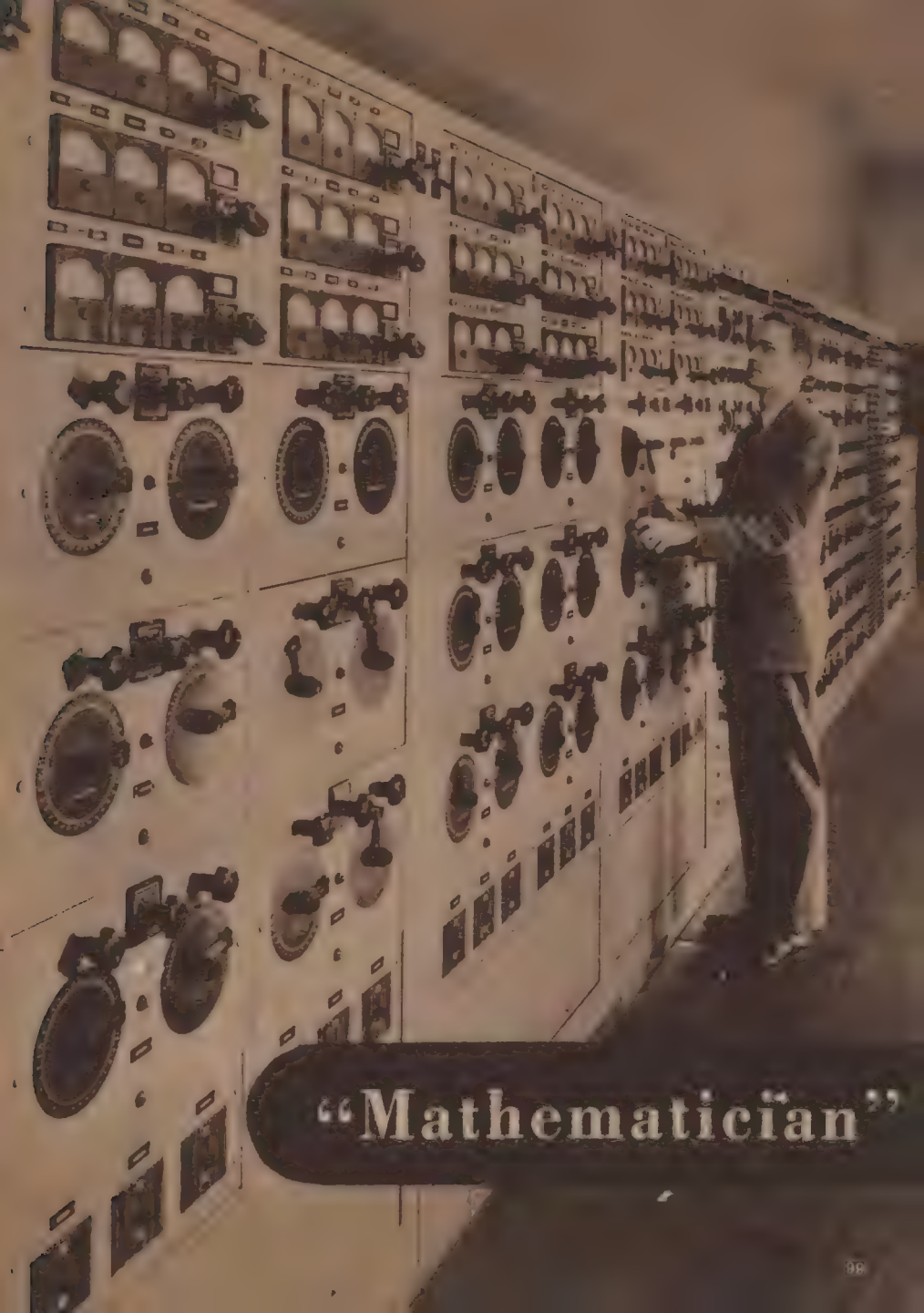
Dear Mr. Campbell:

Noticing in Brass Tacks of the March issue a very interesting letter on education, and having enjoyed the caliber of your stories and the scope of your articles in the last few issues, I wish to raise my voice in protest against the curtailment of your magazines.

I use the plural because I am thinking of *Unknown,* the disappearance of which causes me moments of untold wrath. You see, all that talk about the war cutting down on supplies and so forth falls on deaf ears when one looks at the newsstands and finds literally hundreds of cheap and utterly useless magazines lining the shelves, and none of them suffering as have the two good magazines you put out.

The reason for this, it would seem to me, is that the other publications have a much wider reading public, an unfortunate indication of the state of intelligence of the average person. Naturally, the printing of Astounding and *Unknown* is practically a labor of love, a magnifying glass being a necessity in finding one around. Nevertheless, these two magazines are, it seems to me, of some importance, not only as a method of escape, but in educating the torpid mind of the people. Science-fiction has paved the way for much of the work that has been accomplished in the past century, and has done even more in educating the public to appreciate this work. In making something worthwhile and distinctive of Astounding you are doing the people a service.

As for *Unknown,* that was something above and beyond the call of business. It evoked not only the best efforts of your readers, but of your writers. In these days of worthless drivelings dressed up as slick-paper magazines, of a thousand perverted comic magazines, and other trash that is still displayed, Astounding is a beacon on the horizon, while the reappearance of *Unknown* is almost a goal. A word of commendation to your authors for the amount of intelligence and ingenuity displayed in their work.—R. Silbiger.


"Mathematician"

The resemblance between these calculators and any mathematician, living or dead, is purely functional. But they'll do in a few minutes a job of calculation that would take any mathematician such a length of time he'd be thoroughly dead before it was completed. They're circuit analyzers—designed for the single purpose of solving a type of problem that came into existence with the development of power-line networks and interconnected power company lines.

Suppose a new war plant is being installed in Pittsburgh, the power company has to supply that power, and the situation may be such that the existent plants are unable to take up the added load. In our hypothetical case, the answer might seem to be to add more power generation capacity at the Pittsburgh plant of a theoretical Franklin State Power & Light Co. But if all Pennsylvania is tied in on that company's lines, it may turn out that the thing to do is to install the new facilities in Philadelphia, or in Erie.

Sounds like the hard way to do the job? Well, suppose that the Philadelphia area, due to reopening of the long-idle shipyards, vast in-

creases in power consumption at the Navy Base, and similar war-industry loads, plus long-term growth of requirements that can be expected to remain after the war, has overloaded the local generation capacity. The Franklin State company has been making up the deficit by shipping power on the transmission lines from the Pittsburgh, Altoona, and Harrisburg plants. If the new equipment is installed in Philadelphia, it will no longer be necessary to ship power to that city from the more distant plants, relieving Pittsburgh of some of the load, and allowing Altoona to help carry the new plants in Pittsburgh.

Or—maybe that will work out. There's the question of existent transmission lines, and their carrying capacity, the question of what emergency arrangements could then be made if Pittsburgh—God forbid!—got swamped out in another flood, or some other accident knocked out the Altoona plant. Will it be more practical, perhaps, to put the new generation equipment in some site halfway between the two prime load centers, giving a chance to help either city in case of emergency?

There are several hundred factors involved, and several hundred ways each factor can be introduced into the problem. Generation plants scattered all over the state, carrying capacity of transmission lines under their normal ratings, and under emergency overloading, power losses under each set-up, possible growth of the different cities, and scores of others. What happens when lightning hits the Johnstown-Altoona line, and induces surge-currents?

These calculating machines are scale-model devices that can be made to represent any desired power system, with all the various generation stations, transformers, line-resistances, and assorted capacitances, inductances, and losses as well as the loads. Small transformers represent giant high-line transformers; inductance coils and capacitors simulate the lag and lead conditions found on actual lines with actual loads. How to tie in systems for best operation can be tried out by setting up equivalent miniature circuits, and reading on the banks of meters the final results. Ranked thousands of tiny tumber switches throw in loads of various charactertistics under perfect control, as, step by step, complete power networks, almost perfect electrical-characteristic duplicates of their giant originals, are built up. Lightning bolts strike them at will—in scale-size safety. Magnetic storms surge through the long transmission lines—under rheostat control. A thousand miles of high-tension lines, with transformers, circuit-breakers, generating stations, and distributed loads across the country are compressed into racks of meticulously engineered equipment.

Westinghouse can, with such equipment, know more about power company's lines than the power company's own chief engineer!

THE END.

"They Were Dead—"

by WILLY LEY

***Dogs** have been brought back from death by Soviet scientists—the process worked out till it appears reliable, if the dead animal is caught in time. But the application to human beings involves some immense, but non-biological problems. "We can revive him; should we—?"*

Photographs from Sovfoto-Artkino

Up to about three days ago I was of the opinion that the Russians have a proverb saying "dead dogs don't bark any longer" or, possibly, "don't bite any longer." I must have been mistaken about this saying, Olga fails to recall such a Russian proverb, although she is willing to admit the possibility that it has been so changed in translation that the re-translation bears no resemblance to the original.

At any event, even if the Russians did have such a proverb they would now be compelled to abolish its use. Because, proverb or not, the Russians now have a number of dogs around which bark and, I have no doubt, bite on occasion, dogs which run around and are happy and mate and beget offspring—all in spite of the fact that they once were dead.

Such a statement does not seem to make any sense, the term *"were* dead" alone sounds as wrong as can be. Whole philosophies have thrived upon the simple fact that death is permanent while life is temporary. And when legends and storytellers wanted to say something especially gruesome and dreadful they spoke of the "undead," of things which did not really die and which can be permanently killed only by very special means.

But these Russian dogs are not "undead," they don't lead a half life of some mystic and terrible sort. They live, enjoying life as much as fate has decreed dogs to enjoy life. Nor did they fail to die. They did die, simply and plainly and very completely, dying the death which is sure to engulf any animal—especially any mam-

Death comes to an anaesthetized dog as his blood is drained. This method assures that no vital organ is injured in any way.

mal—when the greater portion of their blood is pumped out.

Here is the story.

The place is the Medical Center at Voronezh, the time is the years immediately preceding the German attack. All the preliminary work—we'll talk later about that—has been done, the experiments which form a temporary goal in the chain of research can now be undertaken. A large dog, of that indeterminable race which distinguishes most dogs in Russia, is put on the operating table. A mask is fitted to its muzzle very much like the masks fitted over a patient's face when he is about to undergo a major operation. Instruments take and record respiration and heartbeat. The dog feels no pain, it is slowly overcome by the ether which it breathes through the mask.

When it is in complete narcosis, a surgeon opens the main blood vessels, each cut and each movement has been carefully worked out and practiced on dead animals, in-

serting tubes, adjusting clamps. The blood now runs into these sterilized tubes and is drained off into a container.

The instrument which registers the heartbeat shows that it is growing more and more faint. Finally it disappears. The curve that indicates respiration becomes more and more shallow at the same time. It runs for a little while as a straight line, then registers a last deep sigh. After that it stays straight. Both lines run parallel without the slightest wiggle, there can be no doubt that the instruments are attached to a corpse. Each and every one of the major and minor symptoms which indicate life are lacking.

The blood, meanwhile, has been placed in a container which looks like an inverted fat bottle. It forms the center piece of a comparatively simple instrument, consisting of a small electric motor, a small pump acting on two flexible membranes instead of pistons and some rubber tubing. The blood is not left completely undisturbed, oxygen is bubbled through it from beneath.

After ten minutes the tubes from this pump are connected with the blood vessels—the draining tubes having been removed in the meanwhile—and the little motor begins to work. The tubes, draining the glass container, pump the blood back into the dog's body, pump it back in the same rhythm in which the dog's heart would beat if it were alive. Naturally the heartbeat instrument starts registering again but what it registers now and for a short time to come is not the action of the dog's heart, but that of the pump, the *Autojector* as the Russian scientists call it. But then the other needle begins to flutter too, the lungs begin to work again. And the heart begins to beat again, helped along for a short time by the autojector pump. After a few minutes the motor is switched off, heartbeat and respiration go on. They do not register in full strength, but as strong as could be expected under deep narcosis. The tubes are then removed and the incisions stitched up and dressed.

The dog is then transferred to the nursery; it exhibits the symptoms of an animal that underwent an operation. The recovery is even faster than a recovery from a major operation would be, which is logical. The only wounds that have to heal are some small incisions and the sutures of the blood vessels. These are not big wounds—the important fact that the animal was dead, absolutely and undeniably dead, for some ten minutes apparently does not enter the picture at all.

Nor does it leave any traces. Those dogs that were killed by draining off their blood and that were revived by pumping it back into the body do not exhibit any symptoms. They recognize their keepers and the people they knew before "death," they eat as before and still have their favorite foods. They still have their favorite doggish games and behave, in general, as if nothing at all had happened. They have the desire to mate, and Dr. S. S. Bryukhonenko, who di-

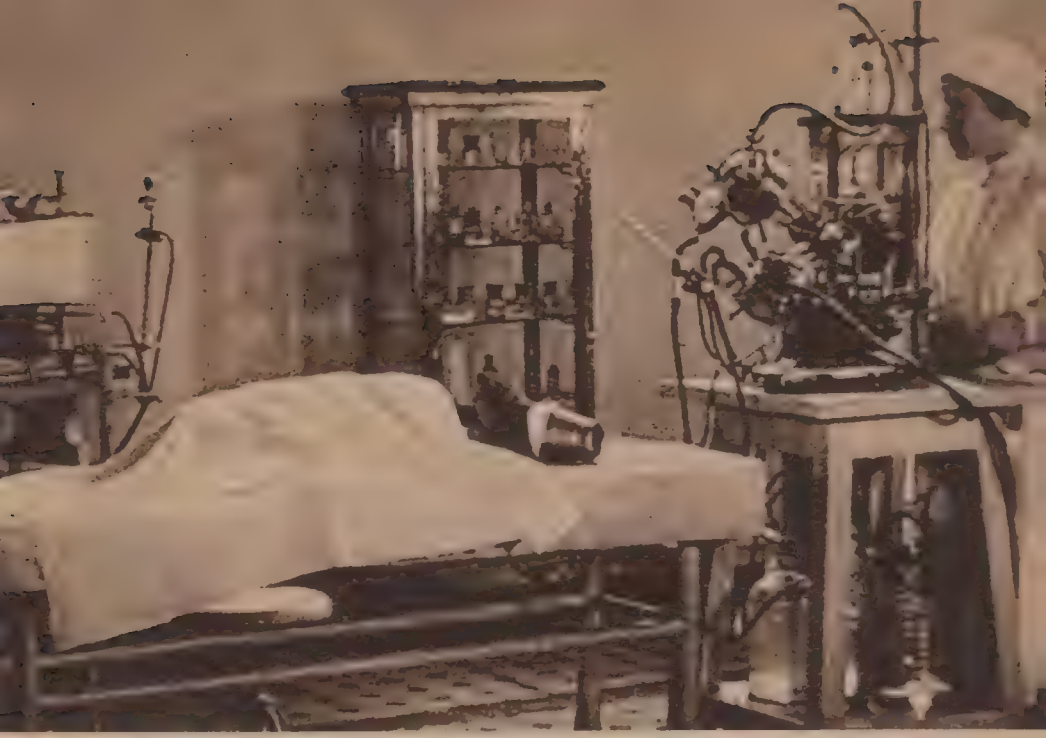
rected these experiments, saw to it that two once-dead dogs were mated to produce offspring. It would be interesting to see whether the temporary death had interrupted that function, the ability to beget offspring which is one of the main criteria of "life."

The result of this mating was the dog "Blackears" which was also put to temporary death for eleven and one half minutes in 1939. This, incidentally, was not the longest period of death, the longest on record so far is the dog "Naida" which was dead for fifteen minutes in 1938.

These experiments were not conceived out of thin air and accomplished successfully by one stroke of an experimenter's good luck. In fact, if the latter had been the case, they would be quite worthless for some time. It is nice when an experiment succeeds unexpectedly, but the goal is always to have an experiment succeed because it was planned to succeed.

The experiment which succeeds

Life comes to the dead animal as the blood is pumped back after a period of death.



The "autojector" apparatus that restores the blood, and acts as both heart and lungs during the period of revival.

without plan only has to be repeated and varied until it becomes known *why* it succeeded.

The dogs "Blackears" and "Naida" and a number of others were put to death and revived "according to plan," the only piece of "luck" in the procedure was that no unlucky accident intervened.

The first beginnings of these experiments go back in surgical history for an indeterminate time. Medical history is full of little stories about this or that man who lost an earlobe or the tip of his nose in a duel but succeeded in having it stitched back on "before it grew cold." It would be more to the point if the emphasis had been placed upon the fact that the man was lucky enough to escape an infection, since the surgeon undoubtedly had dirty fingers and used a needle and gut—or thread—which had never been sterilized.

Some of these stories may be invention, others are in all probability true. It does not matter much since they were all believed and because of that slowly gave rise to the conception that a severed part does not die at the instant of severance.

Conversely it was realized that the death of an individual does not mean that all its parts die instantly too. It was such reasoning which gave rise to some early experiments with grafting, all of them ending badly. The first blood transfusions belong in the same category, except for the minor mistake that blood was taken to be blood, no matter where it came from. Animal blood was considered the same as human blood and a lamb was usually selected as a blood donor, since the blood of such a sweet and kind animal could only be beneficent to the patient.

The power of belief did not prevent the patients from dying and finally a famous physician made the biting remark that a blood transfusion requires three sheep: one from which the blood is taken, another to whom it is given and a third that performs the operation.

For a while all ideas about blood transfusions and grafting were forgotten; when they were revived medical science had learned enough to avoid the most glaring errors. In 1901 the grafting of pieces of blood vessels—both kinds—was accomplished successfully for the first time by the German surgeon Dr.

He was dead. The revived animal is not only alive, but alert and has his full intelligence.

Three that were dead—and dead more than once! "Blackears" in the center, offspring of killed-and-revived parents, proves the process does not cause sterility.

Garré. Five years later the French-born Dr. Alexis Carrell followed in Garré's footsteps, but surpassed him considerably in various respects. Carrell did not only show that it was possible to graft a piece of a vein into a severed artery and vice versa, he also proved that the inserted piece did not have to be "bloodwarm." In fact Carrell had a small "bank," as it is now called, of such pieces in his icebox, and he showed that with proper handling and good refrigeration they would keep usable for considerable periods —the record being sixty-six days.

And then Carrell made his famous experiment with the chicken heart which was kept alive indefinitely in a glass container. Contrary to popular belief it was not a whole chicken heart, but just a tiny piece of tissue from the heart of a chicken embryo. But the experiment proved its point just the same: small pieces of tissue, even of so highly evolved a vertebrate as a bird, could be kept alive and made to grow by cell division outside the body if proper body conditions were supplied.

After the first World War these experiments were carried farther, whole organs were kept alive for a

period of time outside the body and the by now almost proverbial experiment of keeping a head alive and making it react to stimuli like noise and flashes of light and strong tastes was carried out more than once.

The Russian scientists at Voronezh went through all this once more, rapidly they progressed to living hearts and lungs attached to machinery. A dog's head was kept alive for several hours.

It all proved once more that isolated organs and even limbs do not die at once when separated from the body and that the time of their death can be postponed for quite some time with the proper measures. Meanwhile the science of blood transfusions and blood banks —greatly pioneered especially by Russian physicians—had progressed enormously too. It was clear that blood, too, could be kept in workable condition and free from decay, apart from the body.

The question now was: just "how" dead is the body of an individual or an animal that died from some specific cause? If somebody was asphyxiated all his organs were, logically, uninjured or rather uninjured except by lack of oxygen. If somebody died of shock, the same should be true.

Now this is a point that must not be misunderstood. An asphyxiated person, or a person dead because of shock, is *dead,* not "apparently dead." It is not a supercoma, it is death. It is the separate organs, or those not directly injured, that are still alive. It is somewhat in the nature of a house that has collapsed and, therefore, ceased to exist as a house. But the separate bricks have not yet had time to fall apart, they are still all right. Or like a machine taken apart, if put together again it will function, provided that none of the parts had time to rust away in the meantime.

The Russian experiments proved that nothing "rusts away" in fifteen minutes in the case of a large dog. Nothing at all, none of the physiological functions is impaired. Nor any of the mental processes as far as the mental processes of dogs can be observed.

In that respect the Russian experiments close a case: the body of a lightly injured animal can be restored to life, theoretical reasoning has been borne out by experiment.

But just because of that success dozens of new questions have come up, questions which would not be asked if the experiment had been a failure.

The main question in the layman's mind is, of course, whether this experiment can be applied to people. The answer to that question is "not yet." But it may be taken as an indication of the hopes of the experimenters that this work was not done in a biological or zoological but in a medical research institution.

The "not yet" implies that a few other questions have to be answered first before this main question can be attacked. One of these other questions is how long it takes until one of the "parts" becomes

"rusty." And how and why. And whether something might be done about it. Carrell's early experiments indicated very clearly that the process of "rusting" had something to do with temperature. If the parts of tissue were put in cold storage, they remained usable for a much longer period of time. Evidently the process of "becoming rusty," or of dying, is slowed down by low temperatures much in the same manner as the life processes themselves are slowed down by low temperatures. This in turn suggests that what is slowed down is fundamentally a chemical reaction. Purely mechanical actions are not influenced by temperatures, neither are electrical processes, at least as long as the temperature is above the boiling point of liquid air. That a slowdown occurs points to a chemical nature of the processes, at least to a partly chemical nature.

This conclusion receives further

Of importance equaling and perhaps exceeding the revivification work is the ability to maintain life and function of separated organs—even the brain. This severed head, licking its chops, shows continued sensory and motor activity.

Separated lungs connected to the autojector apparatus continue their function.

support by what knowledge we have about life and death. Living tissue, living protoplasm, presents the somewhat strange and at first glance mildly confusing picture of constant change for the purpose of maintaining constant sameness. On a much simpler order we have the same picture when we look at a burning candle. Constantly small quantities of wax are melted, taken up by the wick, evaporized and oxidized in contact with the air. The oxidation produces heat which melts more wax which is taken up by the wick and so on until all the wax is consumed. Constantly wax, the food, is supplied to the flame, constantly the flame throws off the product of its activity—carbon dioxide—constantly things are different, nothing is precisely alike for

A heart, supplied with oxygenated blood pumped into its vessels, resumes beating in normal rhythm.

even two seconds in a row. But the flame does not change, it remains the same in size and color and shape, unless disturbed, the constant change going on among the smallest particles results in constant sameness of the whole.

The living cell is like that, except that enormously complicated chemical and electrochemical reactions substitute for the simple oxidation in the candle flame. The living cell also needs a constant supply of food and also throws off waste matter all the time, that way a permanent balance between all these reactions is maintained. The sum total of all these well-balanced reactions spells "life." A profound disturbance of the balance means death which causes another chain of reactions. It is at this point where

certain chemically very active substances, called enzymes, come in. These enzymes are present all the time, but they seem to have no function as long as everything goes smoothly. Their function, if let loose, is to digest the tissue.

The body does not only strain to prevent this function, occasionally it makes use of it. If food in the larger sense is not forthcoming, if the stomach stays empty for some time and if the individual cells begin to starve in consequence—then the body releases its check on the enzymes to a certain extent. The enzymes can attack body cells, but not all of them. The cells of the brain and of the nerve tissue resist, those of the blood vessels and other organs do, too. Those of the muscles do not resist quite as well, and those of the fatty tissue resist hardly at all. Some of the cells, carefully selected for relative uselessness, are killed to provide food for the others. And the bear which has hibernated most of the winter wears a fur coat eight sizes too large when he emerges. But he lives.

The body makes use of these enzymes on occasion. But when it really dies all chains break, the enzymes go ahead completely unchecked and cause decay, long before the bacteria which produce the "real" decay had time to arrive and to multiply.

We would like to know more about the mechanism of cell-death, it would help our understanding of the whole complex of problems considerably. Still, even that is not the most important question. We can get around the difficulty of not properly knowing and understanding what takes place provided we know reliably the duration of the "time of grace" before it takes place. It would be fine if we knew how to check those enzymes artificially, but until we learn that we would be satisfied by mere knowledge of the time interval.

It seems that there is some straight line relationship between that interval of time and the size of the body concerned. The films taken at Voronezh were shown to me in a private preview so that I had enough privacy to take note of some details not mentioned in the sound-track commentary. In addition to the complete revival of one dog a total of three once-dead specimens were shown. One of them had been dead for eight minutes, another for eleven and one half minutes and the third for fifteen minutes. This sequence—which is not the sequence of the experiments—is also the proper sequence of size, the longest time belonging to the largest of the three dogs.

If we assume that the death of the parts is primarily caused by lack of oxygen, this sequence makes sense, the bulkier body obviously has a larger reserve at its disposal.

There can be no doubt that size does play a rôle. Poisons and drugs are often labeled in milligrams per pound which means that the poison, in order to kill, has to be administered at the rate of so and so many milligrams per pound

of body weight. The same holds true for narcotics; I'll never forget the feeling of emotional dizziness I experienced when I heard some such figures for a very special "patient."

A rhinoceros in a German zoological garden had a badly infected tooth which had to be extracted if the animal was to be kept alive. Otherwise it would either bash its head in because of the pain, or else it would die of general infection. Of course it is possible to extract a rhino's tooth, using instruments which, in point of size, would fit a blacksmith's or plumber's tool kit. So far, however, nobody has succeeded in talking a rhinoceros into submitting to a dental operation. Rhinoceros bulls are not any too tractable even when completely healthy. Consequently a general knock-out was required and the dentist estimated that he would need about one hour's time for the extraction. The anesthetist made his computation on the basis of body weight and administered nine hundred grams of chloroform and two hundred grams of ether. Two pounds of chloroform and seven and one quarters ounces of ether!

Size obviously does play a rôle.

A computation made on the basis of size, or rather weight, with the assumption that there are no secondary factors, produces the result that the fifteen minutes for the largest of the three dogs could probably be stretched to at least thirty-five minutes in the case of a human.

The next question is whether the kind of death plays a rôle. It is likely that it does, but it is hard to guess just what rôle it may play. Probably the time interval which could elapse before revival could still be accomplished successfully would not be the same in three deaths resulting (A) from carbon-monoxide poisoning, (B) from snake bite and (C) from heart failure because of sudden fright. I placed these three possible causes of death in this order because it is my guess that the time interval available in the case of carbon-monoxide poisoning would be the shortest, that it would be somewhat longer in case (B) and still longer in case (C). And the usual time interval would probably be still longer, and very much longer, in a case of death by exposure to cold.

Of course we'll have to know more about the whole problem, but the causes of death just mentioned are those where it is likely that medical science will succeed at some not too distant time to revoke death.

All of them, however, involve an enormous responsibility of which we'll talk later. First it has to be mentioned that the first attempt at revival of a human being will probably not be made on a dead person but on a patient who has been killed. I do not mean a person killed by an accident or in battle, I am speaking of a deliberate temporary killing for the purpose of performing a needed operation.

There are cases and they are, unfortunately, not even very rare, where a person is doomed to die

even though a surgeon could perform an operation which would prolong the patient's life for many years. The point is that the operation which would prolong the patient's life is itself not compatible with life. The patient would live for years afterwards—and die soon without the operation—provided the operation could be finished. But the operation itself would kill the patient.

At present such operations are not performed, of course, because they would kill. But now, since it is proved that death is not necessarily permanent, this dilemma does not look unsolvable any more. If the patient can be killed and the operation performed while he is dead and life be called back when everything is over—*then* the whole problem looks different.

Needless to say that such a case of temporary death is a simpler proposition than a revival of victims of snake bite or shock. The patient does not arrive dead at the hospital, after a possibly indefinite length of time. He dies in the hospital, on the operating table even, with most perfect control of all factors involved.

The crux of the matter is the brain.

Generally speaking what did work with dogs should work with men, save for that one doubtful point. The dogs at Voronezh displayed all their physiological and mental functions after their temporary deaths. But—dog lovers must forgive me for this—the mental processes of a dog are nothing to boast about. Even the dog owner who talks for hours about the intelligence of his pet would not be willing to exchange his own intelligence for his dog's.

Animal experiments of a kind resembling the Russian work which were undertaken in the United States a few years ago seemed to indicate that the brain is the organ which dies first. It is quite likely that the evidence was not misconstrued but introduced by a faulty technique—personally I am inclined to believe that this is the case—but the possibility exists.

Now the human brain is by far the most enormous brain on this planet relative to the size of its owner, even though it is surpassed in absolute weight by the brains of the elephant and of the largest whales. Once it was thought that the human brain was also enormously delicate; medical experience of the first World War has shown that the brain, too, can stand some injury, mostly because it apparently has a lot of reserve bulk which can take over to a certain extent.

Still, the brain is a delicate organ. And it is large.

The question now is: would the larger human brain die faster than the smaller brain of other animals? Or would it, on the contrary, last longer because of its larger bulk? Both possibilities exist and the true answer would have to be found before the animal experiments can be applied to humans. The answer to that most important question may be found by taking samples of various body tissues, including

brain tissue, from the bodies of accident victims, suicides and condemned criminals which have been dead for a known length of time. A proper technique for testing the amount of enzyme disintegration could probably be evolved.

Then, in time, tables may be computed and a kind of formula evolved which, based on body weight, will permit us to calculate the length of time after which an attempt at revival can still be made. There would have to be a separate table for the brain. If it turns out that the brain table permits longer times than the body table, everything will be fine. Attempts at revival will be made in any case which falls inside the time limit.

But, if the time figures on the brain table are shorter than those on the body table, the whole problem acquires another and rather complex aspect. Then not only the physician and the next of kin of the victim, but also the legislators will have to speak.

Supposing the body of a man who froze to death is recovered. Best medical opinion states that he died five hours ago. Since death occurred by freezing, the table permits a sufficient latitude, the table for the body itself, that is. But the brain table states that even under those conditions the brain begins to deteriorate after five hours and ten minutes. Revival, in short, would be successful under the circumstances, but whether the mental functions can be restored is doubtful. It is not certain that they won't be restored, nor is it certain that they will be.

It is obvious that it is a very grave and very difficult decision that has to be made in such a case. So far physicians only dealt with the problem of *keeping* a patient alive and professional ethics say that that is the whole purpose of medical science. The question of whether the patient is a highly intelligent and useful member of the human race or whether he is a semimoron does not enter into the picture.

But here the possible moronic status would be, in a manner of speaking, the result of the physician's work. Unrevived the man would simply stay dead, having died in a perfectly legal manner from accidental causes. Who is to decide, in such a case, whether the "operation"—revival—shall be performed or not. The physician? His code of professional ethics does not take care of such a case, simply because such a case was unthinkable before and since Hippocrates. Or should the next of kin decide, provided that they can be reached in time? It is obvious that most of the time—even if they can be reached—they will be quite unable to make such a decision. In general their decision is apt to be based on emotional grounds. Should a decision made on emotional grounds be accepted?

It would need a new set of rules of professional ethics.

And it might require a law—but the legislators will have a hard nut to crack when confronted with the

question whether a person's intellect is, on principle, to be valued higher than his body. It is possible, in legal practice, to restrict a person because of insanity. But I don't think that any country has a law which provides that a hopelessly insane person can or must be killed. (The German SS does it, but the practices of the German SS are far outside of recognized ethics, legal or otherwise.)

Will the law, or should the law, decide that a person is not legally dead within the time interval during which revivification is possible, unless the cause of death was such that it precludes the attempt? In that case the law would take the viewpoint that the resulting insanity is the result of the accident, that the accidental causes, instead of resulting in death, resulted in loss of mentality just as accidental causes may result in the loss of a limb? Or will the law decide that revivification should be attempted only in those cases where it is deemed reasonably certain that the patient can be restored to the status of health which prevailed before the accident? In either case: is failure of attempt at revivification a punishable negligance? And are objections of the next of kin, if based on religious grounds, to be heeded? (The victim himself, obviously, cannot state his opinion and an earlier opinion might be considered invalid.) Finally: is the law going to put the burden of decision on the physician? Logically he is, after all, the only person capable of making the decision, once he has been provided with a set of rules to go by.

All this is, I readily admit, in the future.

The important point is that these future possibilities now exist. The facts are clear: Russian physicians succeeded in reviving comparatively highly evolved mammals from ten to fifteen minutes after they died. The extension of this experiment to human beings for the good of the human race is only a question of time. How long a time or how short a time is something nobody can say at present. But the experience of the last two hundred years has taught that the most violent optimism is never quite optimistic enough if it comes to problems of science and technology.

It is by no means impossible that only ten years from now there might be some people alive who owe this fact solely to a progress which led over the bodies of a few temporarily dead dogs in Voronezh.

THE END.

Get the July Astounding

the Third Tuesday Next Month

Boomerang

by HARRY WALTON

A queerly mixed duel, it was—sharp wits and hate; foolproof, fool-protecting electronic relays and synthetically induced phobias. And one duelist had a very pretty scheme to fool the foolproof—

Illustrated by Williams

Carner got us in by showing a card, and the sharp-faced chap at the door led us to a table near the teleport. It was one of the better speaks, which was why it could afford a private installation. Of course, a teleport paid for itself in a place like this, which most pillars

of society would rather not be seen coming to or leaving. If you were on the City Enforcement League, like Samuel Sporn, it was especially nice to be able to enter a cubicle in your apartment and step out here with none the wiser.

While we waited for Sporn, Carner ordered neoprenzine. I took a Martini and kept watching the teleport. There wasn't any operator, as there was in the regular public installations. You stepped in, dialed the number of the station nearest your apartment, and—*zing*—you were there, cold sober. Just why, nobody had figured out yet, but teleport transmission straightened you up after any number of drinks. It left no hangover.

If you were too drunk to dial properly, or tried to dial a private number, the beam stayed off and you got nowhere. Unless, like Sporn, you had a private installation at home. Then you didn't dial, but held a little polarized disk over a sensitive plate in the cubicle, which tuned your number automatically.

Carner finished his drink and turned to watch the cubicle with me, his thin, sour face wearing a smug look, as though he'd finally thought of a way to get the better of Sporn. It was Carner who had arranged this evening get-together, for what reason I didn't yet know. He'd insisted we meet here instead of going up to Sporn's place.

I found the teleport easier to watch than Carner's face, which wasn't a nice one at any time. The sliding door was shut, of course, and the transmission light was out. I amused myself by guessing just what instant Sporn would show up.

And then he did. The green light flashed, electronic relays did their work, and with a click the door slid open to let Sporn step out. His fat, clean-shaven face creased into a grin at sight of us.

"Right on time, hey?" he bellowed, easing his enormous bulk into a chair. "Great gadgets, those things. Wouldn't be without mine." He tapped the dialing disk that he wore on a strap on his wrist. Although he hadn't had his own installation long, he was as proud of it as a kid of his first plane.

"Mr. Sporn! Happy to have you." The manager had pussyfooted over and was trying to dislocate his neck bowing. "If I'd known, I would have prepared a private booth. The visiphone operator only told me now that you were coming. I trust there was no delay in opening our teleport to you. We must be careful, you know."

"Everything's O.K.," said Sporn. "Show us that booth, hey?"

The fellow did, and left us. A waiter brought adhymal for the other two, a second Martini for me. Sporn took his drink down fast, lit a cigar, and turned his piglike little eyes on Carner.

"Well, Jimmy, let's have it. Sam's waiting. You know Sam'll do anything he can for an old friend."

Talking about himself in the third person was Sporn's idea of whimsy. So was calling Carner

"Jimmy." I don't think James Carner was called that even as a kid, and Sporn knew he hated it.

"In that case," Carner said bitterly, "you might go kill yourself."

Sporn chuckled and waved the cigar. "To save you the trouble, Jimmy? Sorry. But I like the way you come right out and say things. Not like Ed here, who hates me almost as much as you do but is too cursed polite to say so."

I didn't bother to contradict him. Carner, though, was already losing what little good humor he'd had. His lean face was purpling, as it always did under Sporn's elephantine humor.

"Never mind about Ed," he said. "I'd have killed you legally myself before this, if you hadn't gotten yourself declared 4F."

"I got myself declared?" Sporn's eyebrows shot up in pretended surprise. "Man, I've got a nerve block. The psychos say so. Is it my fault you can't call me out?"

"I'll kill you in the end, legally or not." Carner's voice was flat and cold with hatred. It held a sincerity that was like an oath. I began to tighten up inside as I always do when talk turns on killing. Then, knowing what my conditioned reflexes were doing, Sporn turned to me.

"He wants to kill me. Why? For developing Sodorite and making him rich. He thinks you two could have done it alone. The thanks I get!"

"Maybe you'd get more," I told him, "if you'd been satisfied with less than fifty-one percent of the shares. And maybe we could have done it alone."

The cigar came out of his mouth, held by two sausagelike fingers. "Done it alone? You didn't know what you'd found, and Jimmy didn't see what could be done with what he took from you. You two were playing for pennies with a million-credit stack. It was lucky for you I cut myself in." Sporn looked from me to Carner, grunted, and stuck the cigar contentedly back into his face.

Carner tensed his hands on the table. "I want it back, Sam. All the shares you tricked me out of. I'll kill you for them if I have to."

What with all this talk of killing, my stomach was churning the way a 4F's will. It didn't help any, either, that I was full of the old futile rage at hearing these two bicker over what they'd stolen from me. If I'd been normal, I would have stood up and smeared them both all over the floor. But I wasn't. I had to sit tight and watch Sporn chew the cigar over to one side of his face to talk around it.

"So I tricked you out of half of what you'd tricked Ed out of. All right, I was smart. If I'd been smarter, I'd have had you psychoed the way you did Ed. A preconditioned man doesn't go around wanting to kill his friends—or even his enemies."

Suddenly Sporn laughed again, his chins quaking with this return of his good humor. "You can be glad this is 1990, Jimmy. Fifty

years ago, when you made an enemy, it was just too bad. Today you put a psychodynamotor near his room. While he sleeps, it jerks his reflexes around so that even legal killing turns his stomach forever after. It doesn't leave him guts enough to slap your face. Sure, I wish I'd done it with you. You wouldn't be wanting to call me out now."

That was the last straw and all I could stand. My insides were heaving. I got up while the two of them looked at me with curiously similar smirks on their faces—the same sly contempt that men and even women show when they know you're a conditioned 4F. I went to the washroom. There I got rid of the drinks but not of what Sporn had said.

It was all true. I hadn't suspected until that time I'd tried to smash Carner's face for him the day I learned Sodorite wasn't mine any more. I stood there, fist drawn back ridiculously and shaking like an epileptic—and couldn't hit him. He knew that. He didn't put a hand up to protect himself.

"You'll never be able to harm me, Ed. Don't think you can get countertreatment, either. The conditioning was postexclusive. You can't be psychoed out of it."

He was right, as I found out. How he'd managed to get a psychodynamotor I never learned—I imagine the skids were well greased with hundred-credit notes. At any rate, it did the job he wanted done. I had to resign myself to being a 4F for life.

It wasn't bad except when the talk turned on legal dueling or other violent death. My stomach went queasy at such times.

When my yearly psycho-health check showed up my condition, I went down on the tapes as a conditioned 4F, the same as anybody who takes the treatment voluntarily to escape a challenge or involuntarily because the psychos order it. Should anybody try to call me out, the dueling permit would be refused, because I wouldn't have a chance. A conditioned 4F will stand still while his opponent takes pot shots at him. He has an abnormal regard for human life. It was literally impossible for me to do bodily harm to anyone, even Carner. And it's a queer thing to hate somebody as I did him and still be incapable of so much as punching him in the nose.

I'd stayed with him, though, when he offered me three percent of the Sodorite shares to help develop my own discovery. You don't synthesize a new germicidal radioactive every day. I wanted to stick around as much to see it come into its own as to get the sop Carner offered me.

But just now I cursed Sodorite along with him and Sporn. In the washroom mirror I looked as bad as I felt. I had a seltzer from the drinking fountain and then found there was a bracer sun lamp in the place. After five minutes under it I felt better enough to go back to the table.

I'd hoped the conversation would

take a new turn while I was away, but Carner's first words showed it hadn't.

"Waive your exemption, Sam, and I'll meet you legally, each of us taking his chance on killing or being killed. The survivor takes the other's shares."

"Uh-uh. You're younger, Jimmy. Chances are all on your side. Besides, why should I risk a duel? I've got enough, with fifty-one percent."

"I was only giving you your chance," grated Carner. "Since you won't take a fair risk in legal combat, I'll kill you illegally."

"That," said Sporn with an injured air, "would be murder. And very hard to do besides. On top of which, it wouldn't pay, because I'm going to send Donstetter a note tonight. This will suggest that you be psychoed if anything queer happens to me. Which," he finished with an expansive sweep of his cigar, "I'm sure it won't."

"Covered yourself all around, haven't you?" sneered Carner. "But you've forgotten one place you can be hit—your greed. That's what I'm attacking. I'll make you a bet—a bet you can't afford to pass up—that I'll kill you illegally within five days and go scot-free."

Sporn's underlip stuck out, enormous with doubt. "Now wouldn't I be an ultrafool to bet on that, Jimmy?"

"No, because it's the only way to get what you really want—my shares in Sodorite. That talk about having enough doesn't fool me. You want mine the same as I want yours. Well, my plan gives us both our chance, and I'm willing to give you the odds."

"What are they?" asked Sporn, and suddenly all the chuckle was gone from his voice.

As though this was the moment he'd been waiting for, Carner drew a deep breath. "I'll give you a full transfer of my shares, effective imediately. You'll give me a transfer of all the shares you hold, but one to be effective only at your death. I can't even file that transfer while you're alive. You, on the other hand, can record my transfer tomorrow and take full possession of Sodorite as soon as it goes through, five days from now. If you're alive. If I've killed you, I get my own shares back along with yours. But if you're alive, you can invalidate the transfer you gave me, and you'll have won."

It was the craziest thing I'd ever heard, and the craziest part of it was that Carner was in deadly earnest. He was breathing fast, his lean face was unhealthily flushed, and his eyes burned with eagerness.

And Sporn? He was as cool as though this were a directors' meeting. Suspicious, too. I could see him weighing Carner's craziness against the possibilities of a trick. He tore the wrapper off a new cigar very slowly, stuck it between his lips, and lit it carefully. Carner and I were both hanging on his next words.

"How do you know I won't invalidate my transfer tomorrow

morning instead of five days from now?" he asked Carner suddenly.

"That's a chance I take, but I don't think you will. I'd have Ed here as a witness to our agreement. Although it's an illegal one, it would serve to contest my transfer to you. You might or might not win in the courts, but if you play it through, you stand a fair chance of winning everything in five days."

The human mind is a queer thing, especially when tampered with. I wasn't sick now. Maybe the session in the washroom had something to do with that. Maybe I didn't take Carner's crazy talk seriously. I know I didn't believe he could kill Sporn, who was shrewd enough to protect himself from all angles. But I hoped Carner would overreach himself and lose everything to Sporn, which would give me revenge of a sort. After all, it was Carner who'd taken Sodorite from me.

Maybe Sporn was thinking the same way. He looked at me and chuckled.

"The trouble is, Jimmy, that the risk isn't fifty-fifty the way you want things. I'll take you on, but on my own terms."

"What are they?" asked Carner in a voice that croaked with excitement.

"Well, first of all, we make Ed stakeholder. I don't want a transfer direct from you, Jimmy. Might raise questions afterward. My way's safer for you, too."

He pulled a stylus and a foil pad from his pocket, set the thing to write in duplicate, and after scribbling a few words passed me both sheets. It was a legal enough transfer, effective five days from date, of all Sodorite shares I owned in excess of three percent. But the place where the transferee's name should have been was blank, and followed by the words "provided he be then living, and that if he be not, this instrument shall be void."

Sporn gave me the stylus. My hatred of Carner made my fingers shake as I signed both sheets.

I though Sporn would keep them. To my surprise he gave Carner one and stuck the other into his pocket.

"Hold on," I said. "I can't deed everything to both of you at the same time. Which of you files his transfer five days from now?"

"Why," answered Sporn, "the one that's still alive, of course."

It was that simple, that deadly. I should have known what Sporn intended, but hoping to see Carner bested I'd been blind. Suddenly my conditioning was to the fore again. I'd have been glad to see Carner wiped out financially, but this was different. If it went through, he or Carner had to die. I trembled in every nerve while waiting for Carner to turn it down.

He would, of course. The odds were all on Sporn's side. He couldn't be challenged legally, and Carner would run terrible risks in trying to kill him illegally. Forewarned as he was, Sporn would surround himself with safeguards ranging from paid bodyguards to electronic detectors.

But Carner could be called out. Within twenty-four hours some paid killer would challenge him, and as Carner had fought duels in the past, he couldn't refuse a meeting now. It would be altogether legal, and Sporn wouldn't appear in it at all. Even so, he meant to protect himself by getting Carner's stock through me. The whole thing was transparently one-sided. Carner wouldn't dare go through with it.

His face was blotchy with color and his tongue licked his lips again and again. His voice was a harsh croak.

"That's all right with me."

"Good!" Sporn was all grins once more. "We'll call Donstetter and transfer our shares to Ed right now. He can't touch them until the transfer goes through, five days from now. By then the winner can record Ed's transfer to him."

You could see he figured himself as the winner. So did Carner. But both of them couldn't win. The real stakes here were death. I sat stunned until Sporn reached for the telephone.

"This has gone far enough. You can do what you like, but I want out," I said. "Give me back those transfers."

Sporn just grinned at me and dialed a number. I grabbed the telephone and tried to pull it away from him. His hamlike fist didn't give an inch. The only way to stop him was to hit him, and I couldn't do that.

Donstetter, the firm's attorney, appeared on the visiplate. He looked only mildly surprised at this night call. I tried to press the cut-off button, but Carner slapped my hand away.

"Put this on a record tape," Sporn said. "Stock transfer, dated today, April 10, 1990. For value received, I transfer this day all shares of Sodorite Synthetic standing in my name to Edward Lewis, and in evidence attach my fingerprint signature."

He laid his thumb on the visiplate, then turned the telephone over to Carner, who went through the same formula. Donstetter acknowledged record and the thing was done. For five days I owned all of Sodorite. But what I'd heard made me sick in every nerve.

"You can't go through with this," I told them. "You can't. I'll do anything to stop it. I'll denounce you both to the dueling commission. I'll refuse transfer of the stock."

It was a puerile gesture, and I knew it. Actually, I'd never have possession of the stock. I was merely a straw man, and they already had my signature.

Sporn grinned and got up. "Since we'd both deny everything, Ed, the commission couldn't act. Better go home and sleep it off." He left the booth. I followed him as he headed for the teleport. Somehow I knew Carner was coming after me.

When he reached the sliding door of the cubicle, Sporn paused just long enough to hitch the tuning disk around under his wrist. The number gleamed dully on it—64299. Inside it, that same number was indelibly etched on its molecules. I thought of that when I should have been acting, instead, to prevent murder. I even found myself wondering who had the next number, the one ending in 300.

Then the door slid shut behind Sporn and a lock clicked inside. Through the plastic window Carner and I watched him sit down in the transmission chair—Carner staring at him with the whole intensity of his hate in his sunken eyes. I remember how Sporn waved the cigar as he held the tuning disk over a plastic-ringed receptor plate on the arm of the chair.

He was already unreachable. The door had automatically locked behind him. Relays simultaneously made it impossible for anyone to be routed to this cubicle until he was gone. Electronic nerve centers were feeling out into space for a signal that would be emitted if anybody was at this moment in the destination cubicle at Sporn's home. If no such signal interfered, transmission would occur.

Over us the green light flashed.

The booth was empty.

Something clawed my wrist—Carner's fingers. He pulled me away to a secluded table. Sporn was beyond my reach, but I thought I might still influence Carner. His skinny face was redder than ever, his eyes more than half mad. A waiter came and he ordered several drinks.

"You know what you've done?" I asked him. "You've just about committed suicide—you're the one in danger, not Sporn."

He stared at me until I thought he'd burst out laughing—or crying. Then he swallowed his drink in one gulp.

I said bitterly: "I shouldn't care. I wouldn't if I were normal. But I do and it's worse because you tricked me into being a party to it. Maybe I can talk to Sam and call it off. Give me that transfer and I'll try."

Carner laughed. He sounded half drunk, half crazy.

"Look!" he said. "Sam never knew I had this. I got it just after he got his."

He fished clumsily in a pocket. Finally he brought out a short length of Monel chain. It had a catch and a tuning disk on it, and the number was 64300.

"All right, you've got a private teleport too," I said when my first surprise was over. "That has nothing to do with it."

He gulped down the third drink in three minutes and called the waiter. I waited impatiently while more drinks were brought.

"Don't you see?" I pleaded. "The way things stand, you've got to kill Sam or he'll kill you. And it'll probably be you."

He shook his head owlishly. "I don't have to kill Sporn. Ever." He cackled drunkenly. "And he can't touch me. Know why?"

"He can hire a dozen men to call you out for him."

"Not any more. But I wouldn't kill him. Never meant to. Killing's illegal. You wouldn't kill anybody, would you, Ed? Not even me!"

I saw it was useless and got up to leave. Carner wasn't used to liquor as Sporn was; he was hitting the skids fast. It was no use talking to him tonight. Tomorrow might be too late, but I couldn't help that.

His skinny hand grabbed me again. "Sit down. You want to know about Sam? I'll tell you. Funny. You hate me but I can trust you. Even if you knew I did murder, you wouldn't tell, would you, Ed? You wouldn't tell, because they'd execute me. That would be two killings. No, you wouldn't tell."

He paused for another drink. I'd never seen him this way.

"Know how a teleport works?" he went on. "When you dial a public number wrong, nothing happens. On a private one, you aren't beamed out until the subscriber has seen you on the telephone and accepts transmission. Everything is checked to protect you. But tuning disks can't dial wrong, and only subscribers have them, for their

own stations. So the beam goes on without any check.

"Once I read about an experiment they tried back in '79. Two receiving booths were tuned alike. They transmitted a rabbit, thinking they'd get two rabbits. But they never got any. When two receivers are tuned alike, the beam splits to both. The rabbit's still out there—somewhere."

He paused and let the next drink pour down his throat, while I sat staring at him with a seed of horror sprouting in my brain.

"You get it now, don't you?" he chuckled. "I got friendly with the technicians who installed my station. They showed me the tuning assembly. Before I came here tonight I loosened three setscrews and turned three dials—to 299 instead of 300."

He leered drunkenly at me, enormously proud of what he'd done. I got to my feet somehow, wanting only to get away and stifle the sickness that was welling up in me.

Again his fingers clawed me back. "Hold on, Ed. I haven't killed Sam, *because he isn't dead.* He's just as alive as when he traveled here tonight from his own station to that one over there. He was transmitted as a bundle of ultrashort electromagnetic waves. That's what the technicians told me. And that's what he is right now. Can you imagine Sam as a bundle of waves? Maybe he'll meet the rabbit."

With shaking fingers he tried to pour my untouched drink into his glass. The stuff spilled and made rivulets on the table.

"You got to be smart to beat Sam. Well, I was smart," he went on. "Once I set my station back to my own number, there's nothing to tie me to his disappearance. Why, we all saw him leave here alive. Plenty of witnesses to that. Besides that, I didn't kill Sam, because he isn't dead. He isn't dead! Makes you think you could have done it yourself, doesn't it, Ed?"

Strange how his drunken logic soothed me. It was true enough, in a way. If Sporn hadn't been received, he still existed in the form of unconverted energy, and in that form was virtually immortal. His body had simply been changed into so many kilovolt amperes of radiation. But it hadn't been killed. His soul hadn't been torn from its body; his body had simply been whisked away from his soul, cleanly, bloodlessly. Death hadn't touched him, and he was beyond death.

But he hadn't been killed. Even I could have done it.

The waiter brought more drinks and I watched Carner swallow them. I thought how useless all Sporn's cunningly intended safeguards had been. The note he'd undoubtedly planned to send Donstetter this very night—to cheat Carner if by long chance it was he who won. My own transfer back to him of the Sodorite shares—that had gone with him. That was now part of the bundle of waves that was Sporn. Only the transfer

Carner had on him remained.

Carner hadn't talked much more, or if he had, I hadn't heard him. Now he was completely out. A waiter noticed it at last and looked him over with an experienced eye.

"He's had his share. Friend of yours?"

"Not exactly," I said. "Not enough for me to bother to take him home."

The man sighed. "Give me his address and we'll take care of him."

"That should be easy," I said, trying to keep a tremor out of my voice. "He was bragging about his private teleport earlier this evening. He even took the disk off to show me, and then put it back in his pocket instead of on his wrist, he was that drunk."

The waiter patted Carner's clothing expertly. In a matter of seconds he found the disk and strapped it on Carner's left wrist. I sat watching and pinching down my nerves while two men lifted his inert form gently. They carried him into the teleport and propped him in the chair. One of them laid his wrist, with the dial under it, on top of the receptor plate.

They stepped out and closed the door.

I jumped up as if springs had been cut loose inside me. I stood trembling and praying and swearing deep down inside.

The green light flashed. One man looked in the window, nodded, and turned away.

Suddenly I was rock calm. Transmitted by teleport, Carner should have arrived home cold sober and in shape to take a call. I got a telephone and dialed his number. A voice answered right away.

"James Carner is not in. He expects to return about 21:20 Thursday time. James Carner is not in. He expects—"

The automatic voice would have gone on, but I touched the cutoff button. Carner had expected to return home, but not by teleport. He must have known he wouldn't be received if no station was tuned to his number.

But he'd had a disk, and the transmitter had tuned automatically to a nonexistent 64300. There was no check on disk dialing.

I owned all of Sodorite again.

THE END.

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PROBABILITY ZERO

CONTAGION

by

George Holman

On my arrival on Venus I left the No. 3 spaceport and, conforming strictly to Colonial Law, went to the port hospital for quarantine examinations. I was shown into the office of Dr. Luegner, Venusian pioneer physician, who listened to my protests that I had already been inoculated against all known contagious diseases. There were no germs indigenous to Venus.

"I'm sorry to inconvenience you," the physician said, as he laid out the atomizers, hypodermic needles and serums with which to immunize me against some of the diseases prevalent on Venus, "but the activities of disease organisms vary greatly with the environment. Diseases such as typhus, tuberculosis and smallpox, which often prove fatal on Earth, may be mild or nonexistent here, while common colds, catarrh, dandruff and acne are often deadly. Also, some ailments not regarded as diseases on Earth, such as anger, fright, moodiness and appetite, often cause epidemics here."

I felt the prick of the needle and the swelling of a vein as the serum entered. "Twenty years ago kleptomaniacy was regarded as mental unbalance," the doctor said, as he laid the needle aside and opened my mouth. "Today this peculiar human activity is known to be caused by the germ kleptococcus pilferatorius. It is invariably accompanied by the germ prevaricatus falsificatum, without which it cannot survive. Before being exposed to these germs by contact with human immigrants, these native Venusians would not lie or steal. After they became infected, they began to lie like Trojans and to steal everything they could get their hands on. But after Hansel isolated kleptococcus pilferatorius an antitoxin was developed, and the Venusians were cured of stealing."

"We have not been so fortunate in gaining control over prevaricatus falsificatum," the doctor explained further, as he pressed my tongue down to peer into my throat. "Almost everyone coming from Earth brings along a mild form of this disease, and it rapidly becomes worse. It is never fatal to colonists, but epidemics of lying sometimes wipe out whole tribes of Venusians."

I gagged slightly, but the doctor opened my mouth wider, "Just as in typhoid, a person may be a carrier of prevaricatus falsificatum without being aware of the fact," the doctor went on, twisting my head from side to side as he inspected my tonsils. "There may be no noticeable symptoms. For instance, during an outbreak of appetosis vulgare, the hunger epidemic, I went north among the Kaja tribe of Venusians in search of an antitoxin. That tribe seemed to be immune to that disease, as they always had large quantities of food lying about which had not been eaten more than once or twice. They had never seen an explorer or colonist before. I knew that, like other humans, I was a carrier of many diseases which might prove fatal to the Kajas. But the fate of the colony depended on my finding an antitoxin to the dread disease which makes people eat everything, and finally die of over-extravasation."

"Clear your throat," the doctor ordered, as he reached for an atomizer. "The Kajas treated me hospitably," he went on with his narration. "But they would not tell me what they used to ward off attacks of appetosis vulgare. However, three days after my arrival they began to show symptoms of prevaricatus falsificatum."

"Not only because it was my duty as a physician, but also because I had inadvertently carried the dread disease among them, I did my best to save the Kajas. My efforts proved futile. I awoke one morning to find them all dead. They had choked to death on the yarns they had been telling one another."

The doctor pressed the bulb of the atomizer two or three times in rapid succession. "Now, swallow," he said gently.

THE ABSENCE OF HEAT

by

Gordon Garrett

The boys at the "Flamepalace" on Antares III were telling the usual run of stories at the back table when the black uniform of a Galactic Patrolman walked in. The uniform was filled with the clean-cut figure of Jerry Hammermill, captain of the ship, *Velmar,* which had just docked at the spaceport on the other side of the planet.

Unperturbed by the questioning looks from the table the captain seated himself and ordered a round of drinks. After a few minutes tall tales were being spun as though no interruption had come.

Soon the captain himself unlim-

bered and asked a question, "Did I ever tell you about the time me and the boys saved the whole Galaxy? No! Well, it's like this—

"We were out on a dead planet called Polaris XIV, way out about eight hundred million miles from Polaris, and Mumsen, the ship's chief scientist, runs into the craziest life-form you ever saw. It seems, according to Mumsen, that these crystalloid organisms will utterly destroy any and all organic material that they come in contact with, and that it propagates rather queerly. Each crystal is filled with internal strains and explodes into small pieces which grow large again. Well, Mumsen figured that the whole planet was loaded with these and that they would explode in exactly seventy-one Galactic hours, and the small crystals would be spread all over the Galaxy.

"None of the rays on the ship had any effect on them, and an atomic bomb would only serve to make them explode faster. Of course it was impossible to get to the nearest civilized outpost in time to get instruments that would stop it. Hard as it seemed the solution was simple. As you know, the Patrol ships are fitted with a refrigeration unit which will allow them to pass through the center of a sun, even a blue-white, without injury, so we disintegrated a hole to the center of the planet and put the refrigeration unit in it, and started the motor. As soon as we could take off and, in free fall, we fixed our spacewarp mechanism and went back to our base."

"Now I suppose you're going to tell us that you froze them to death, Wolverine."

"Yes, and I happen to know that there isn't any such planet as Polaris XIV," contradicted one of the others.

"Why, I thought you would understand, you are all men of science and should realize what happened. You see, the planet had a temperature of only a few degrees above absolute zero, and, at absolute zero, all matter ceases to exist. All we did was to lower the temperature those few degrees. We just froze the planet out of existence."

SECRET WEAPON

by

Robert Browning

We were seated in a small cafe discussing the war and the problems it presented when we were joined by Captain Nemo.

"Congratulate me," he said, while sinking into an empty chair, "I have just been advanced in rank."

"Good for you," rose the chorus, "and to what do you attribute your success?"

"Well," he began, "you all know of my many years in the submarine service. I might even say, in fact I will say, I am the oldest man in that branch. As you know, the U-boats have been sinking our ships at an alarming rate. All the ordinary methods of combating them have failed. The Navy finally came to me, as the most ex-

perienced submarine man in the world, and asked for a method to overcome the menace."

"And you solved it I suppose?" piped up one of the diners.

"Oh, I can tell you how it is done," retorted the captain. "They tried it out and it was so successful they're going to broadcast the method to show the enemy sailors that they haven't a chance. It might even end the war."

"Well," I snorted, "give us the dope, dope."

"O. K., O. K., don't get so impatient, here is how it works. We took the *Normandie* and ripped everything out of her hull but the driving equipment and then filled every available inch with generating mechanisms. She could supply all of New York and Pennsylvania with electricity right now. Then we hung a cable, into the water, from the stern and another from the bow. Next we attached an electromagnet to the hull.

"Then we went on a cruise and when we turned on the juice to the magnet, it pulled in every sub within ten miles."

"Well, after you got the sub, what did you do with it?" I asked. "And what were the cables for?"

"Why we sent a diver down and he fastened one of the cables to the sub, then we turned on the current to them. You probably know there is a lot of metal in solution in the ocean. I simply used this to electroplate the submarine until it got so heavy it sank."

THE END.

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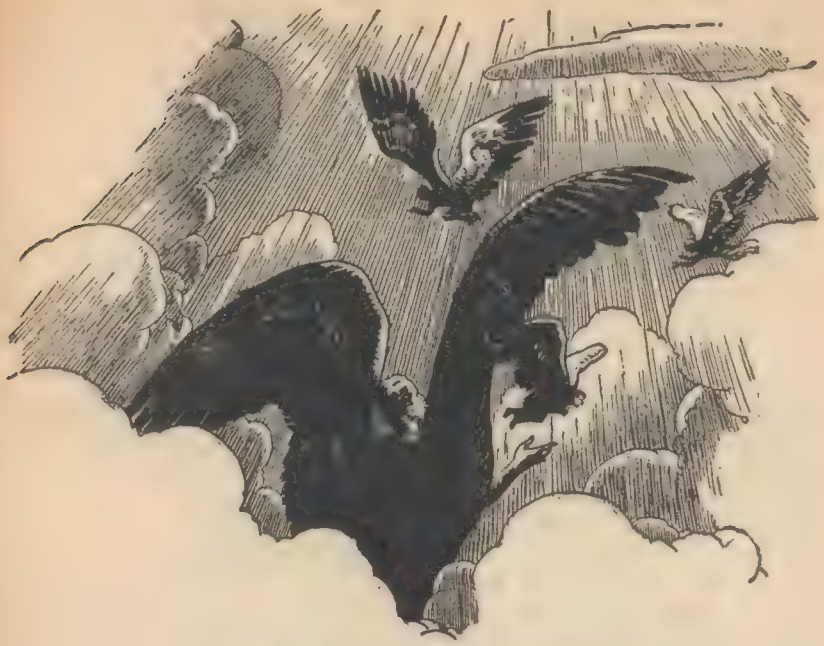


by E. MAYNE HULL

Conclusion. *In a world a millon years from now the winged men and the amphibian race of men wanted supremacy—and the kidnaped submariners of 1945 had it in their power to decide which should win. But which should they aid—?*

Illustrated by Orban

Synopsis.

Nearly one million years hence, the world has been subjected to a second flood—a water-bearing nebulosity in space has condensed on Earth, drowning all land. The men before the flood arrived had prepared in three ways: some left the planet to establish colonies elsewhere, and two different types of man capable of surviving on the drowned planet were evolved—the amphibious "fishman," and the

winged "birdmen." The winged men have a city on an artificial mountain floating in air, supported by repulsor beams; the amphibians live comfortably at the shallower sea bottoms. Each type can survive the period of inundation, and each race is waiting the recession of the waters, to take over the whole planet once more.

Each, however, feels that the other type must be eliminated. There's nothing the winged race can do, since the great science of the pre-flood days was not given to them in its entirety, to prevent just such wars—each race was given plenty of defensive science, but no offensive means to match. But the amphibians found, in a submerged city, the ruins of some offensive tractor beams with which they have been able to reconstruct the devices. Slowly they are forcing the floating city-mountain of the winged people downward, toward the sea.

The winged men, seeking some means of attacking the amphibians, have sent scouts back through time to find weapons of earlier ages which may be able to turn the trick. The great science of the just-pre-flood days is barred to them because of the nature of their time-travel method. But they have been able to go back and kidnap vessels of many ages.

One of these is the submarine Sea Serpent, *a United States submarine on duty in the Pacific against the Japanese until Nemmo, one of the winged scouts, lifts it nearly one million years into the future. Nemmo establishes communication with Lieutenant commander Jones-Gordon and Lieutenant William Kenlon, and the rest of the sub's crew during the several weeks spent cruising from the spot the time-jump lands them to the site of the floating city. He explains the situation to the kidnaped, and rebellious men; the winged people need help, and will return them to their proper place in space and time when the problem of the amphibians is solved, but only then. Further, Nemmo says the sub is probably the answer to the problem, because subs were not used as military weapons after the twentieth century, yet a sub is the one form of warship that can get at the submarine city of the amphibians.*

One other answer to the problem of the kidnaped sub is that the amphibians, too, have the necessary knowledge to make a time-traveler that can return their sub. And they'd almost certainly do it if the sub helped them against the winged people. But there's a lot of excuse for the kidnap methods of the winged folk—desperation. They have been attacked already. On the other hand, Kenlon has seen one of the amphibians, a giant of a man, strikingly handsome, enormously powerful, with a face stamped strongly with intelligence and fine character.

Either group can return them. Which to help—

Then, just as they near the floating city, an amphibian abruptly appears from the sea's depths and snatches Lieutenant commander

Jones-Gordon overboard, vanishing again into the depths—leaving a trail of bubbles as the far from amphibious Jones-Gordon is dragged downward.

PART II.

There was silence except for the restless swishing of the sea. The motors had stopped. The submarine rolled uneasily in the sullen waters under the overhanging mountain that floated in the sky above them.

The silence ended. "Merciful heavens!" gasped the helmsman five feet from where Kenlon stood staring into the dark sea.

The words broke the spell. The paralysis drained from Kenlon's mind. Navy training rushed to his rescue. He poised there a moment longer still weak from reaction, and then, abruptly conscious that everything now devolved upon him, galvanized to full life.

His first desperate impulse came, to take the sub down in pursuit of the murderers.

Instantly, the realization reeled in upon him that he couldn't do anything so hopelessly foolish.

His brain quietened before the sheer impossibility of a rescue. He stood very still, forcing himself to think, to feel, to let the realities sink into him: the faint sounds, the salty tangy smell of the sea, the alien facts of the visible life around him—all these his body and his mind soaked up like an insatiable sponge. And finally the essence of all that extrania was integrated; and the first series of answers came, the first action that he must take.

Rescue was impossible, but one thing was certain: over a reasonably long given course, the *Sea Serpent* could outdistance any fish, human or otherwise, in the wide gray ocean. Therefore he could get to the city of the fishmen ahead of the murderers.

Whatever purpose they had with the skipper's body could be frustrated by getting there first and waiting for them.

Kenlon snatched the phone out of its waterproof box, and connected with the engine room.

"Half speed ahead, both engines, Mr. Craig."

"Half speed ahead, both engines. Aye, aye, sir."

The engines chattered. The *Sea Serpent* began to move. Kenlon turned to the quartermaster helmsman.

"Durosky, set a circular course around the big zeppelinlike machine out there, keeping at about this distance. Run her around and around until further notice."

"Round and round. Aye, aye, sir."

The terrible taut feeling began to lift from Kenlon. The consciousness that Jones-Gordon was dead was a constriction around his heart, but his brain and body were functioning now, especially his brain: and, as always in the past, the iron demands of duty eased the shock and the pain.

The *Sea Serpent* was moving. No fishman could now hope to keep

pace with her, let alone scramble aboard. There was time to carry out the next necessary step to the realization of his purpose. But first—

Once more Kenlon made a phone connection. With Tedders this time.

"Rouse Benny, Dan," he said grimly, "and bring him up to the bridge without delay."

"Where's the skipper?" asked the irrepressible Tedders, as he came through the hatch. "I thought he was up here. And what about the shots that were fired?"

The expression on Kenlon's face must have struck him then, for his eyes widened, and he stared wildly at the bleak, fantastic scene.

Kenlon waited until Lieutenant Benjamin had climbed onto the bridge. The second officer looked around swiftly; his gaze took in the overhanging eyrie, narrowed speculatively on the torpedo-shaped machine; then flicked back to Kenlon. He saluted, and stood expectant. Kenlon began:

"Durosky!"

The helmsman saluted. "Aye, aye, sir?"

"Tell Mr. Benjamin and Mr. Tedders what you saw happen to the skipper. And all of you remain on fullest alert. I am going below to get a course from Nemmo."

He plunged down the hatch. Nemmo looked up in surprise from a copy of the *Times* he was bending over in his intent way.

Kenlon did not pause to write his message. He made his request verbally in the language of the winged men; and he must have been understood, for Nemmo looked at him sharply—and refused the information.

"I'm sorry," he said in his English. "From your agitation I can see that something has happened. But my duty was to bring you to the vicinity of our city. In a few minutes one of my fellows will undoubtedly establish contact with you.

"For some reason, our council has discouraged our giving such information until it gives the signal. So far, we are following its advice. If for any reason we change our minds, I shall let you know."

Minutes later, he had still not changed his attitude.

Kenlon forced calm upon his jumping nerves. He stood finally chewing his lips, letting the tenseness drain from his body. He felt genuinely ill from the excitement, first from reaction to what had happened, then from the developing feverishness of his effort to obtain from Nemmo a directive concerning the location of the city of the fishmen.

It wasn't, he told himself, that great speed was absolutely necessary. He had the impression somehow that the fishmen lived a considerable distance away.

The *Sea Serpent* could make thirty knots on the surface; and, therefore, provided there was not too much delay, could easily get to the city ahead of the two mur-

derers and the body they were transporting.

A small depth charge expelled from a torpedo tube would do the rest.

He grew aware that Nemmo was speaking again. "What has happened?" the winged man asked.

Kenlon hesitated. His reasons for withholding until now the fact of the skipper's death were varied. They were partly rooted in Jones-Gordon's logic that the winged men were enemies, a dictum with which Kenlon disagreed, but which he had not even thought of questioning. In the second place he had not wanted to give these flying folk the idea that the officers and crew of the *Sea Serpent* were now automatically on their side.

As the lieutenant commander had said, the United States Navy didn't fight private wars.

Nevertheless, the fishmen must want the body for some purpose, or they wouldn't have taken it with them. The winged men might know what that purpose of the fishmen was.

With abrupt decision, Kenlon described the attack. When he had finished, Nemmo stared at him with troubled eyes.

"I have no idea," he said finally, with a curious precision, "what they would do with a dead body."

He paused, finished: "And what is your plan?"

Kenlon explained that, too. For a long minute, then, the winged man was silent. At last he looked up.

"What are you going to do with me—keep me aboard, or release me?"

It was a complete change of subject; and Kenlon smiled with a wry sense of defeat as he considered the vain possibility that Nemmo might be persuaded to change his mind. His close association with the man had given him an impression of an honest, scholarly man with a negative personality.

Nemmo had seemed much more alive when they had first captured him. But that was probably due to their intense awareness of his wings, his alienness.

There could be no doubt, however, of the winged man's strength of will. A man who could take the risks he had taken in going to 1944, wouldn't weaken now if he had decided NOT to tell something.

Kenlon's purpose remained too strong for him to accept any kind of refusal. He ignored the other's question, said thickly:

"Will you answer this: how far are we from the city of the fishmen?"

The words must have contained his first big phonetic error, because Nemmo seemed not to understand. The hindrance jarred Kenlon into startled realization: For minutes on end now, they had been talking together with only—he remembered them now, though at the various moments he had scarcely noticed—occasional hesitations.

Kenlon said wonderingly: "You know, Nemmo, under stress our brains didn't do badly with their new languages."

He paused, frowning. "Well,

why shouldn't we? We had three hundred hours of sustained study without interference from other students. That's almost as much time as I gave to my German and French."

He caught himself, remembering his purpose, and repeated his question, with articulation this time.

"How far . . . from their city?"

Once more, the winged man sat pondering, as if he was considering angles to the problem, of which Kenlon knew nothing. At last, he shook his head, gravely

"Lieutenant, if I had my way, I would gladly give you this information. The fact, however, that not even now are you ready to attack the sea city is disturbing. But there is the council. It has barred the transmission of knowledge relating to the location of the city under the waves. The bar, as I said before, has troubled all winged men, but so far we are not resisting the council's decisions."

He picked up the copy of the *Times* he had been reading, then looked up quickly.

"One precaution: The moment a member of my race arrives, tell him the Gihlander protective lamps should be adjusted before your ship comes to rest."

Kenlon did not answer. He felt exhausted, as if he had strained too hard against a heavy object. He made his way towards the hatch, but paused to gulp down a cup of coffee and a doughnut. A seaman came running.

"Mr. Kenlon, sir. Mr. Benjamin says to tell you that a flying boat has put off from one of the other ships, and is coming towards us."

Kenlon reached the bridge in thirty seconds flat.

The scene outside was much the same as when he had left it. Except that everything was from a different angle. The *Sea Serpent's* circular course had taken her to the far side of the zeppelin—he called it that now in his own mind. Near and shiny red in color was a narrow, high-decked vessel with a streamlined transparent hood over her full length.

It was from her, apparently, that the flying boat had come.

The machine was coming on very slowly, not more than three, possibly five knots an hour. Her line of approach would take her across the *Sea Serpent's* course approximately a mile further on. Kenlon could already make out human figures sitting in her.

The sight stirred a deep part of his mind. A consciousness came of the wonder of this moment, of the tremendous and exciting events that were transpiring minute by minute.

But the violent death of Jones-Gordon was too recent. The stirring, the thrill ceased. His interest declined notably. Bleakly, he turned towards the two officers. He said in a drab voice:

"Durosky has told you about the skipper, gentlemen."

They nodded. Both men looked strangely white. Benjamin saluted, said:

"You may count on our loyalty, sir."

Dan Tedders snapped, his lean countenance drawn into vicious lines, not a fraction of his usual lightness in his tone:

"I hope, sir, you're going to let the city of the fishmen have some of our beautiful torpedoes."

Kenlon did not reply. The statement, the emotional hatred behind each word, jarred, then disturbed him.

It was startling to realize that he had not even thought of attacking the city proper.

Frowning, Kenlon returned his attention to the approaching craft. It had made a little headway. Watching it, a new angle struck him, the thought that, in his previous calculations, only the zeppelin had worried him. And yet, now, the first sign of life and action had come from one of the smaller vessels.

It might be wise to devote intensive study, not only to the thousand-foot giant but to the smaller ships as well. After all, an outsider would regard the *Sea Serpent* as belonging to the smaller craft, and dismiss it as unimportant beside the zeppelin.

Yet three well placed torpedoes from the sub's tubes would sink any ship anywhere.

Altogether there were seven of the smaller machines, and each had some strange un-twentieth century quality. The two farthest away were hard to make out clearly. They were unmistakably ships, looking very low in the water, and streamlined to the nth degree, with long, sleek hoods neatly covering the deck. In spite of the similarity however, they were not the same, neither in shape nor size.

Three of the remaining five machines didn't look more than a hundred feet in length. They were all different, one from the other. One looked like an enormous fish—or a small zeppelin. A second looked squat and menacing. Its deck bristled with stubby, shining objects that could be weapons, but looked very unnormal.

The third was more of an ordinary looking ship of the twentieth century except for two shining towers that rose up like masts from the deck, and towered to a ridiculous height.

Of the two remaining ships, one was the high-decked affair from which the flying boat had come. The last ship was a globe about eighty feet in diameter that floated very high in the water, and had no visible portholes. It lay there, a dully gleaming metal ball.

Beside Kenlon, Lieutenant Benjamin said: "How near are we going to let them come, sir?"

"Eh?" said Kenlon.

He twisted and stared at the air boat, now drifting along less than two hundred yards away. He felt a brief wonder that its speed could be as slow as it was. But that passed in a sharp re-awareness of the meaning of Benjamin's words.

He thought dimly: How close shall we let it come?

Quite frankly, simply, he hadn't thought of it as dangerous. He—

"The way I look at it, sir," said Tedders, "is that these people are in the same box as we are, dragged here exactly the way we were. I don't see us starting to fight our descendants, or they their ancestors."

"Exactly!" said Kenlon. But he didn't say it out loud. The boat was a hundred feet away; and a tall, uniformed officer had stood up in the bow. There was no time for detailed thought, or hesitation. Kenlon commanded:

"Mr. Tedders, cover them with one of the ack-acks. Mr. Benjamin, sound the general alert, have half a dozen armed men come on deck, and order speed reduced to four and one half knots."

Kenlon scarcely heard their acknowledgments. For, abruptly, he was feeling very silly about his precautions.

The air boat was only a score of feet from the conning tower. The people in it were plainly visible. There were seven of them; and they were all women.

The flying boat bumped gently against the bridge and clung there. Its deck was higher than the streamlined railing, so much higher that the woman, standing up in the bow, loomed above Kenlon.

Her position gave him the impression that she was abnormally tall. Then he saw that it wasn't just her vantage point. She *was* tall. She towered five feet nine . . . ten—Six feet.

Her uniform was of a thick silk-like material, looking very womanish in its texture, yet military. She was military, too, in her face and manner; and her voice, when she spoke, had the clipped quality of assured command. She said in English:

"Greetings to the twentieth century."

Kenlon's mind did a twisting somersault. English. Strangely accented. But English!

The thrill that had stirred earlier inside him, and had seemed to die, returned; and this time it came alive.

His stomach, so taut for minutes now, actually for days, his mind black with a hundred mortal worries, loosened, lightened. Suddenly, the violent death of Jones-Gordon came down to its proper perspective, a grievous but not destroying incident in the life of a fighting man who had stayed on his feet to carry on the fight.

Awareness came of the callousness of his attitude, a sad consciousness of the brutality of the war that had made him accept the death of his friend and commander after the shortest possible period of grief and shock. But the reality was that events were unreeling at a reckless pace. All that mattered was—

He was here; he William Rainor Kenlon, American, here in the world of 994,999 A.D., commander now of one of the mightiest war machines of his own age, a 1944 United States super submarine, loaded with twenty-four inch torpedoes, complete with antiaircraft guns and a seaplane, the whole costly and elongated structure cap-

able of cruising under water for ninety-six consecutive hours, and so heavily armored that theoretically the sea was supposed to remain outside even if they found it necessary to go down to a depth of eight hundred feet.

The woman was speaking again, in the language of the winged men this time, a puzzled note in her voice:

"What is the matter? Do you not understand American? Are you one of the barbarian non-Americans of that age?"

Kenlon laughed. He couldn't help it. If this was what subsequent ages believed, then it was easy to see who had won all the wars from the 1940's on.

With an effort, he forced an end to that whirl of amusement, said in English:

"I beg your pardon, madam. I was so overcome by the fact that you actually spoke . . . American . . . and that—"

He stopped, struck by the truth of his own words. For a month he and the others had lived in an alien universe, made all the more terrible by their mental isolation from the people who lived in it. True, he had learned the language of the winged men. But it wasn't the same. The ability to establish a halting communication only emphasized the gulf between the two species of human.

That was over. Here were comparative compatriots. What age they came from didn't matter. It must be reasonably close for the language to have held its general form, yet also far enough away to have blurred the fact that the non-American world of 1944 had not necessarily been barbarian.

He parted his lips. Before he could speak the young woman said:

"My name is Dorilee. I am Tenant of the Joannas guarding the Sessa Clen on her way to her marriage bed. May I come aboard?"

Kenlon heard the last sentence only vaguely. His whole mind was concentrated on the meaning of what she had said. It took a long moment to grasp that the strange nouns she had used didn't matter. Here were women soldiers escorting another woman, evidently a per-

sonage, to her wedding.

It was not until his brain had gone that far that the woman's final sentence penetrated. Simultaneously he saw that she seemed not to expect any assistance, and that she had taken his silence as assent. She vaulted lightly down onto the bridge.

She straightened as tall as he, and smiled a generous smile. Her eyes were hazel, her lips firm, her face a little too long for beauty. She said:

"We have been hearing about you for more than a week now, the suggestion being rather strong that you were the only one with a ship capable of carrying out the requirements of the winged men."

She glanced curiously along the deck, then into the hatch.

"So this is a real, live submarine. The only one I ever saw was in a museum in Greater Clen City and —"

In spite of his intense absorption in every word she was saying, Kenlon had to cut her off:

"What you said a moment ago— you say you have been hearing about us for a week?"

The woman faced him again. She seemed to comprehend his meaning instantly.

"You have a winged man aboard, have you not?"

"Yes."

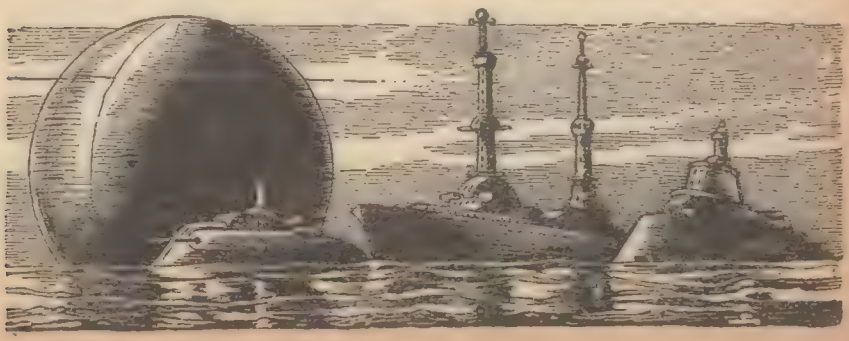
"He has been communicating by" —she hesitated over the word— "the kedled waves with his superiors for a month, though it was only last week that I had learned the language sufficiently to understand the import of what was being said."

She went on: "We discovered a similar kedled instrument on the winged man who came aboard our ship. It is skillfully woven into the clothes he wears."

Nemmo, Kenlon was thinking, you cunning devil. Not, he realized laconically after a moment, that it mattered.

"May I go down into your ship?" the woman said. "Perhaps later you would like to look over ours."

Kenlon was thinking harder of Benjamin's words as he led the Tenant Dorilee through the control room.



He had seen the frown on the officer's face, the moment after the woman had made her request. He had immediately stepped close to Benjamin, said in a low voice:

"I see from your expression that you disapprove the idea of taking her below. Any reasons?"

"None, sir." Benjamin's face cleared. Evidently the mere putting into words of his doubts had dissipated them. "After all, one woman cannot possibly be dangerous. And, besides, I can see that Mr. Tedders was right. These people are in the same fix as we are."

"What interests me," said Kenlon, "is the possibility of examining their ship. The way that lifeboat floats in the air is wonderful. No matter what else happens, we could use that.

"Sound a warning to the crew below that a woman is coming down on inspection. And keep an eye on the—Joannas—in that boat."

It was funny, but once in the control room, none of the reasons sounded quite so sensible. There was a curious alertness about Dorilee, an intense eager interest; her gaze flashed a little too avidly in and out among the instruments.

"And this," she said, "is the center from which all the automatic machinery is controlled?"

"That's right," said Kenlon.

The moment he had spoken, he realized that she had meant her question differently than he had his answer. To him, the control room was the center from which the commander directed the ship. Whereas automatic machinery and automatic controls implied something far more advanced.

In his daydreams he had sometimes tried to visualize a completely automatic submarine, requiring only one man to operate it. The picture had included a series of plans for the adaptation of the type of electronic tubes that could control the current passing through them. The use of such a principle to control motor speeds, to control valves, to control the myriad functions aboard a sub should greatly reduce the normal hazards of submarining.

And then there were several dozen extensions of the gyroscope idea, already in use in various operations; and then there was—

The picture had never come quite clear. There were always a number of practical obstacles that his trained mind insisted on confronting. These obstacles rose up now to keep the picture he tried to evoke as dim as ever.

Her words and his thoughts about them had another effect. They brought into new, vivid relief the fact that this woman was from a later age than his own. He felt suddenly breathless. He half gasped:

"What age, what century are you from?"

Dorilee turned and looked at him. "The one hundred twentieth century after Christ," she said, "though we do not chronologize that way."

Ten thousand years! It was longer than he had thought. The

English language must have attained a stage where it was no longer challenged; and thus triumphant had ceased to change except in minor details.

His mind paused, because—Ten thousand years! The time involved suddenly intoxicated him. The 994,999 years of the winged men had had a meaningless quality that briefly staggered the mind, then left it blank and uncomprehending. But ten thousand seemed graspable, somehow intimately near and wonderful.

He forced an end to that singing thought, and rushed on: "And that airboat—how does it float in the air? And why did it go so slowly?"

The woman smiled tolerantly. When she spoke, it was in the tone of someone explaining something to a child:

"It works by magnetism. We simply pointed the facer at your submarine. The metal in your ship drew us along at a speed based upon a mathematical proportion to the amount of metal involved. Since it was small, our speed was slow."

Kenlon was immune to her superiority. "But you didn't come directly towards us," he pointed out.

Dorilee shrugged. "Certain deviations are mechanically possible," she said. "In my time, the Earth is covered with straight lines of metal nodes above and to one side of which the traffic streams."

She was a big, conceited blonde in a male type uniform. She oozed superiority complex; and he didn't like her at all now. But her very origin in an age a hundred centuries after his own gave her a glamour transcending all personal qualities.

"Any more questions?" she asked.

Questions! Kenlon sighed. His whole being quivered with questions.

"Those other ships," he started. "Where are they from? What are the people like who are on them? Why—"

He stopped, with an effort. And waited. The woman said:

"Three of the ships have refused all intership contact. The very large one is a space yacht from about 185,000 A.D. One of the others is a patrol gunboat of what they call the Iimen civilization, which seems to have existed about 700,000 A.D. The remaining ship has offered no information, though it accepts visitors."

She paused. "And now," she smiled, "let me ask some questions: You know why the winged men have brought you here?"

Kenlon nodded. The woman continued: "Are you going to do as they desire?"

"Frankly, I don't know," said Kenlon. "You've caught us at a very confused moment."

He explained about the death of Jones-Gordon—and felt a sharp dismay at the quiet way he could describe the event, as if it was something that had happened long ago. It seemed very far away, already divorced from his emotions.

He thought, shamed: Too much was transpiring too swiftly. He *had* to keep his mind on the present and the future, not the past.

He finished: "My idea is, this

whole situation should be examined with great care before any action is taken."

The woman was staring at the floor, thoughtfully. Her hands were in her pockets, her manner almost diffident. She looked up abruptly, said decisively:

"That is what I came to find out. In the name of the Sessa Clen, I herewith take control of this submarine."

"You what?" said Kenlon.

He had half turned from her to speak to the assistant electrical engineering officer, who was standing stiffly at attention beside the chart table chair from which he had leaped when they first entered. Now, staggered, he twisted back to the woman, and simultaneously drew his gun.

The Tenant was in the act of withdrawing her right hand from a side pocket.

"Careful!" Kenlon whipped. "Bring your hands up slowly, and raise them above your head."

The hand came out, clutching a fistful of white crystals, some of which spilled on the floor at her feet, and lay glittering.

Something flowed from them, something palpable and strong, that held him immovable. With a desperate will, he strove to press the trigger of his aimed revolver; then in a very spasm of panic struggled to open his mouth, to shout a warning. But the immobility extended to his fingers and to his face and throat, and to his legs and arms.

Kenlon stood as still as death, his brain roaring with the knowledge that he was paralyzed.

A woman was about to capture a fully armed, fully manned United States submarine.

His confined world continued to be full of a number of things. The Diesels chuttered away; there was the strong feel of the movement of the *Sea Serpent*. Beyond the thick glass plates of the control room, in front of which the electrical engineering officer was standing, looking even more rigid now, the sea was still washing over the long deck.

From the corner of one eye, Kenlon saw the woman climb down out of sight. He thought in anguish: If only Benjamin or Tedders would look down the hatch—No, that wouldn't help. The crystals'd get them too.

He stood there.

He felt no pain; nothing. His mind was clear. His body seemed normal. His heart must still be beating; his lungs performing their function; his stomach still digesting the part of the doughnut he had eaten.

Yet he couldn't speak, couldn't move.

He was ruined; he knew that. The woman didn't seem to have any murderous intent. She was merely taking control of the submarine, in order to carry out the purpose of the winged men. She had discovered that the *Sea Serpent* alone could accomplish that purpose; and she hadn't wasted any time.

No matter what the limitation to her intention, it didn't make any

difference. He was disgraced before his men. Within an hour of inheriting command, he had lost the ship.

After several minutes he caught a flashing glimpse of the woman making her way towards the engine room and the stern torpedo room. She must have been forward sprinkling her damnable crystals.

This very instant men were lying or sitting or standing down there in whatever position paralysis had struck them—thinking about a commanding officer who had let them down.

Dorilee climbed up into the control room. She was carrying a heavy sack. "Hand guns," she explained.

"What a terrible ship," she went on, shuddering. "Everything so confined, and just a narrow corridor between those frightful engines."

Involuntarily, Kenlon's mind leaped back to the pigboats in which, as an officer in the naval reserve, he had taken his yearly training cruises. The brief wonder came, what would she have thought of those, compared to which the *Sea Serpent* was a luxury liner?

The thought snuffed out. He stood there. The expression on his face must have shown his strain. The woman glanced at him sharply.

"Stop it!" she said. "There's no disgrace in being defeated by superior science. There are ships within a mile of us that would regard the weapons at my disposal as if they were so many toys. I'm sure you're going to be sensible about this."

Kenlon knew he wasn't. He had always recognized that women had a different psychological outlook than men. It took a woman to be completely oblivious to such dishonor as he had now suffered.

She was speaking again: "Ordinarily, we would never have taken such action as this. But the Sessa Clen must be prepared to occupy the marriage bed within two weeks. Or else her place will be taken by her sister.

"You may say, why not, when the winged men finally return us to our time, ask them to see that we re-emerge within seconds of where we entered. They have told me that the mechanical laws of time travel make it necessary to allow for all the time that passes here."

She went on: "What was finally decisive was the statement of the winged men that they would permit no one to return to their particular age until the city of the fishmen was destroyed. So you see"—she shrugged—"we have no alternative. We must use your ship to carry out their purpose."

It was an apology of sorts; grudgingly Kenlon recognized that. There was nothing evil here. He should have known though, should have realized that a woman on her way to be married was more of a human tigress than a human being.

It had all sounded so simple and normal. The fact that her sister would replace her if she didn't arrive in time showed that it was some monstrous royal or something custom, which everybody in the

period would take for granted.

"There is no reason," Dorilee said, "why there should be any bloodshed."

The statement was so odd that Kenlon was torn from his bitter meditation. The words seemed meaningless. Except for the two officers and the half dozen men on the bridge, the ship was—

Kenlon's mind stopped there, and flooded with understanding. Benjamin, Tedders, Durosky and the others. That was it. They had still to be disposed of; and there must be some difficulty about it.

"Those men outside," said the woman, "will either have to surrender or suffer serious injury. The neurals do not work in the open."

The "neurals" must be the paralyzing crystals. As for surrender—quite suddenly Kenlon knew that Benjamin and Tedders were as good as dead.

It wasn't that navy men didn't surrender. But not immediately; not until their arms, legs or heads had been shot away.

The grim thought collapsed as, out of the corner of one eye, he saw the head and shoulders of Benjamin bend down over the open hatchway, heard Benjamin say: "A winged man's coming, sir; he—"

The words broke off; the officer roared: "What's going on down there?"

With a jerk, Benjamin drew back, but his voice thundered down to Kenlon above the muffled beat of the Diesels:

"Tedders, drive that boat away. The rest of you men, grab your guns!"

He must have grabbed his own, for his body came plunging down the ladder. He was followed by five men.

It was beautifully fast work. Normally, it would have overwhelmed a single person. Now, they fell in a heap, and lay rigid. The woman walked over and disentangled them. They sprawled stiffly, looking stupid, amazed, dismayed.

Except for Tedders at the ack-ack gun and Durosky at the helm, the *Sea Serpent* was a captured ship.

Kenlon pictured the young officer, tensed up there behind the battery of antiaircraft guns. Perhaps in minutes now he would die in a futile outburst of defiance. Futile because his first logical move, even if he succeeded in driving away the air boat, would be to come below.

Kenlon saw that the woman was turning away from the fallen men, their guns gathered into the crook of her arm. She dumped the weapons into her sack, then drew a thin metal bar the size of a comb out of her pocket, and approached Kenlon.

"I want you to go up on deck and persuade your junior officer to be rational. You will be able to do this because this charged plate"—she held up the bar—"will release you from thrall about a minute after I put it into your hand."

She thrust it downward towards him; and Kenlon felt the cool touch

of it against his hand. He hadn't realized how feverish he was. The coolness was like a breath of air into a hot, dry room.

"As soon as you are able," said the Tenant, "close your fingers around it. And don't do anything rash. I can neutralize the bar in a flash."

He didn't believe that. Her own immunity must derive from something like this; and if she neutralized his, then she, too, would be subject to the neurals.

In spite of the conviction, he had no intention of testing her statement by counteraction, not now, not until he had a plan.

This whole thing had to be thought out, even argued before action could be wisely taken. There was a second winged man outside now. If he could manage to tell him the state of affairs, and persuade him that the whole purpose of the winged men was endangered by this highhanded seizure—

The thought drained. Quite automatically he had flexed his fingers; and they moved. They *moved.*

His mind nearly leaped out of his head, so violently did his emotions react to that return of the ability to move.

And, strangely, just like that, the awful depression of spirits left him. He clutched the bar convulsively, and watched the woman back away, her gaze narrowed on his face, one of her hands resting lightly on a metal rod in her belt. She said:

"As soon as you have talked to your men on deck, I shall give you some clothing, which has the neutralizing element woven into the fabric. You can wear it under your uniform."

She finished: "There is no reason why you should be under restraint. We have no desire to cause you unnecessary indignity."

Kenlon said: "You are making a grave mistake. This is not an automatic submarine. You cannot possibly hope to operate it without a skilled crew. You—"

He stopped. Speech had come so naturally that it took a moment to realize that only seconds before his voice could not have sounded. He lifted his arm, then took a step; and it was all easy and natural again. He was free of thrall. Free. He said steadily:

"My advice to you is to give us back possession. I promise to take under consideration an attack against the fishmen without reference to what has happened. You will get nowhere by the course you are pursuing."

The woman said: "You had better hurry on deck. The situation up there cannot be improving."

It wasn't. White as a sheet, Tedders had his gun trained on the air boat; and he was waving at them, threatening.

The women were crouching behind their gunwale, aiming a long metal rod at Tedders. He listened glassily to Kenlon's explanation of what had happened, said finally:

"What am I supposed to do, sir—leave the gun?"

The question shook Kenlon. A little unsteadily, he walked over to

the hatch, and called down to the woman:

"You still insist on going through with this?"

"Tell your man," came the clear, firm answer, "to get away from the gun. Then you invite my Joannas aboard."

Slowly, Kenlon straightened. He felt old and tired. He stared almost unseeingly out to the gray sea, then up to the mountain in the sky, the lower end of which sagged a third of a mile above him.

The half blank upward glance brought into his view the winged man whom Benjamin had reported. The flying man was circling about three hundred feet up, peering down at the scene. He looked uncertain; his movements lacked purpose.

The very aimlessness ended the slim hope that he might bring the help that was needed within a minute. Kenlon sighed, and turned heavily to his junior.

"All right, Dan," he said, "come out of there."

A moment later, the Joannas were briskly jumping aboard. Resistance was at an end.

There was not much physical change in his position. Kenlon wandered disconsolately to the railing, and stared forward. In a vague way, he was aware of the air boat drifting slowly away from the *Sea Serpent,* one lone Joanna in it. Obviously she was being sent back to the parent ship.

He was aware, too, that of the five Joannas who had come aboard, four went below, leaving one to guard Tedders, Durosky and himself.

One woman to look after three men. Kenlon laughed curtly. In view of the fact that a single female had conquered a ship with a crew of seventy-five, the one guard, in the truest meaning of relative values, actually outnumbered them by about twenty to one.

His reverie ended, as Tedders put his right elbow on the railing, then lowered his weight onto the elbow. The young officer sallied gloomily:

"Is big sister going to tuck us below, too, where we'll be out of harm's way?"

Kenlon groaned: "She plans to save me from indignity by letting me walk around clutching this metal bar."

He lifted the hand and the bar with a vague gesture, then went on:

"I can learn to grin like an ape, maybe I can administer good cheer to the men.

"It might be the only way," he added hopefully, "of breaking their thralls. One look at me, I mean, and they'd have to get up to punch my face. It would be irresistible."

"Frankly," said Tedders soberly, "that doesn't sound as if it will work, though I'd be willing to add my mug as a specially seductive punching bag."

He broke off: "What do you think those neurals are made of?"

Kenlon described briefly the scene of energy flow that had impinged on his body.

"I would say the crystals give off

electrical or rather electronic impulses that interfere with those nerves which attempt to carry out voluntary actions on impulse or command from the brain."

He went on grimly: "I have some lunatic notion of waiting for an opportune moment, and then going around and sweeping up all the crystals, and tossing them overboard."

Said Tedders: "You won't pull anything like that over on little Dorilee. That woman reminds me of my father's second wife."

"I suppose," said Kenlon, "we'll just have to accept the situation. I believe she will hand the ship back to us afterwards. My duty, therefore, is to ease the minds of the men, and do everything possible to see that these Jonahs don't wreck the sub. I can't let seventy-five men down, or take risks with our sub, because my pride is hurt."

It was a dismal solution. But Kenlon had arrived at it during the anguished moments before surrender; and every minute that passed made it seem more practical.

"Personally," he said harshly, "I hate the fishmen for the ruthlessness of their action against the skipper. It was a cold-blooded business, treating us as if we were so many sub-human beasts.

"But I never thought it a strong enough reason to destroy their city, particularly as I had in mind something that's never been mentioned: The groundmen, the mighty groundmen, who made both the winged men and the fishmen, created the two types for a purpose, nothing less than that man should continue to exist on Earth in spite of the greatest catastrophe that surely has ever befallen an inhabited planet.

"To undermine that plan, that great purpose, to satisfy the desire of this Clen woman to get married is the most pitiful excuse for action that I've ever heard."

"I'm willing to admit," Kenlon went on less violently, "that frightful flaws may have occurred in the two species who were to make the plan work. The fishmen *seem* to be at fault, and to be the aggressors—Nemmo tells me they've got tractor electronic beams on the floor of the sea under here, and have already drawn the sky island a mile downward to the water. Their intention is to submerge it, and drown all the winged men, so Nemmo tells me. If that's true, then something drastic should be done to stop them."

He finished with a shrug: "It looks now as if it's going to be done, though my idea was to get all the facts first. They—"

He stopped, because out of the corner of his eye he saw the Tenant come on deck. The woman spoke to the Joanna guard.

"Wave that winged man down," she said. "He should have been able to see by this time that the capture was successfully carried out."

Kenlon had the feeling that he had not heard aright. He turned, his whole body stiff.

"What did you say?" he asked in a flat voice. "The winged men are party to this assault."

He didn't need the affirmative answer she gave. The Joanna had beckoned; and in response the winged thing in the sky was growing second by second by second in size.

Funny that he had not during the whole period while the *Sea Serpent* was being captured thought of the winged men as having a pre-connection. It all fitted of course. In their desperation, they had very cunningly used the Sessa Clen's anxiety to occupy her marriage bed.

Their desperation must be great indeed to have overridden the gentle racial character traits he had discovered in Nemmo.

Kenlon felt a sudden sadness. The whole business was becoming more sordid every minute. Now that there was no alternative, he'd be glad when it was over.

The winged man's gingerly extended, gray-clothed feet touched the railing. Lightly, the man wafted down beside Kenlon.

He was a little taller than Nemmo, and younger, more personable. His face, however, had the same hawk-like qualities: thinness, blazing gray-blue eyes. He wore the same furry cloth from the neck down, which fitted so snugly that, as in Nemmo's case, it was hard to believe that it was not part of his body.

His wings were a very dark gray, with here and there streaks of black.

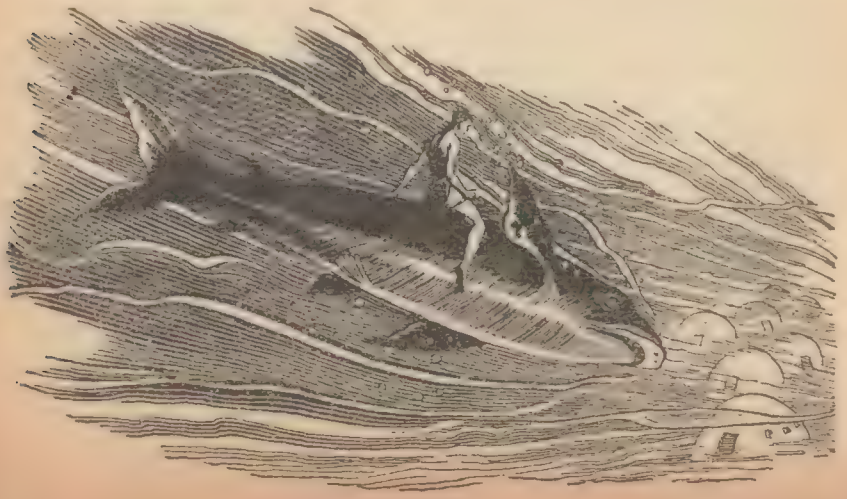
He walked over to Dorilee without looking at Kenlon.

"Any trouble?" he asked in his own language.

"Naturally not!" was the tart reply.

Kenlon smiled grimly. It would be nice to be so positive. Not that she wasn't telling the truth. There hadn't been any trouble worth mentioning.

He liked her less and less.



The winged man was speaking. "There is a change in the plans."

"Change?" said Dorilee. Before the man could answer, she went on, snappingly: "All you've got to do, Laren, is tell us where the undersea city is. We'll do the rest."

"The council," said Laren, "wants to see him first."

"The council!" said Dorilee. "The council! That's all I ever hear. First, the council advises you not to tell us the location of the city; and you don't tell us. Then—"

She paused, scowling. She lost all claim to prettiness when she scowled.

"I thought," she finished, "you winged men were ignoring the council in this."

Laren shook his head. He said with a quiet dignity: "We shall never ignore the council. It distresses us that, in this affair, its ancient purposes seem to be clashing with the harsh reality of our situation."

He broke off. "I see no reason why Commander Kenlon should not be taken before the council. You will need time to familiarize yourself with the undersea craft. Nemmo will remain aboard to give you any assistance he may be capable of."

Dorilee laughed. It was a hard laugh. The sound of it brought the thought to Kenlon, that victory did not add any grace to her character. She said arrogantly:

"I do not anticipate any difficulty in operating the submarine. The commander here, and his crew, have a far more important interest in seeing that nothing goes wrong than I have. Their ship is at stake."

She finished indifferently: "But you can have him for a while if you want him. I have sent for a technical book about ancient submarines, and naturally we shall familiarize ourselves with the machinery. Don't let the council keep him too long."

There was a curious resentful look on Laren's face. It was obvious that he didn't like her casual contempt of the council. When he spoke, it was on that subject still. He said:

"We have no desire to do without the wisdom of the council. Perhaps it will give him some information useful in the attack. We *know* that it will do nothing to harm our interests."

He seemed to realize that his words were being wasted. He turned quietly to Kenlon.

"I hope you will not object to coming to our city."

Kenlon did not reply immediately. He had been following the give-and-take of the conversation with a gathering blankness. Memory of what Nemmo had said about the council merely served now to add to his confusion.

The general picture was clear enough. The council of the winged men had released the information that made possible construction of the time tubes which were used to bring the submarine and other craft to 994,999 A.D. Yet the council opposed the actions to be taken by the seized ships. To this opposi-

tion the winged men were paying no attention.

It was clear but queer.

Laren was speaking again: "You cannot imagine, commander, how much we regret the tactics we have been forced to use. It is against all our instincts. I hope, sir, you will come up and see the council."

Kenlon had not intended to give the impression that he was refusing. Of all the things he wanted most was more knowledge—about everything that was going on. He turned to Dorilee, said:

"Before I go, Tenant, I hope you won't mind if I take a few precautions to protect the vessel. There's the fuel to think of and—"

"You may be sure," said Dorilee, "that anything within reason along those lines will have my support. I realize the danger from the fishmen."

Kenlon bowed a stiff acknowledgment, then explained to Laren what Nemmo had said about the Gihlander protective lamps, adding:

"My own idea is that you detach your time machines"—he pointed—"from our nose and stern, and lower them, lighted up, into the water. Their penetrative powers are so great that they should make all the water for a considerable distance literally transparent. The Joanna guards can keep watch. That way we can shut off the engines."

He saw, even before he finished, that Laren was smiling.

"The Gihlander lamps," the winged man explained, "are modified versions of the time tubes. They give an equal amount of absolute light, but have none of the more dangerous properties."

He smiled again, finished: "I have allowed this conversation to be overheard at our communications center, so it shouldn't take long for the carriers to arrive."

Kenlon had been wondering how he was going to be transported. The answer began to be clear when he saw more than two-score winged men wheeling down from the sky. They brought the lamps. They also brought a sling—supported by scores of thin wires, each one of which was attached to a belt around the waist of one of the flyers.

After everything else had been done, Kenlon climbed into the sling; and in a minute his feet left the deck, and he was on his way.

He was looking down at the conning tower and the long, bulging shape of the submarine floating like a toy in bright, transparent water. The glow points of the Gihlander lamps, which hung now in the water, curiously accentuated the impression of a toy sub in an indoor pool with ceiling lights reflecting from the water.

Kenlon swung slowly around and around in his harness, and swayed gently from side to side. To his left he could see the gleaming metallic shapes of the giant zeppelin-like machine and of the other craft which were physically overshadowed by the larger machine—space yacht, Dorilee had called it.

The ships receded slowly in size.

The sea took on a flat appearance. The wall of the eyrie loomed black and near to one side, and below and above, blocking out three quarters of his view in the direction the sub's instruments had always indicated as being west.

After a few minutes more, the space yacht disappeared behind an outjutting angle of the "mountain"; and one by one, as he watched, the other craft were blotted from his view until, finally, only the speck that was the *Sea Serpent,* and the high-riding, red-glinting ship of the Sessa Clen, remained in his field of vision.

Kenlon estimated that he was at least a mile above the sea. Which left about half a mile to go, before he reached the building. He glanced upward to verify the distance; and it was so.

Laren must have noticed the intent expression that Kenlon always got in his face when he calculated. He winged down to a point just below Kenlon. He called melodiously:

"Anything wrong?"

Kenlon started to shake his head; and then with a jerk that was as much physical as mental, stopped the action. Anything wrong! Everything was wrong, his whole universe topsy-turvy. Of all the things in the world that he needed it was information. Information that would straighten out the bends in his mind. Information that would fill enormous gaps. *Information!* First, about the council.

He stated his confusion, finished: "What I want to know is, why is the council opposed?

Laren said gravely: "It would take too long to explain the council to you. Theoretically, it is omniscient. We are disturbed by its reactions in this affair. You will realize the difficulty of our problem in a few minutes when you see the council."

Kenlon considered that, frowning. It was not very clear. An omniscient council whose findings had to be overruled—it was puzzling.

He twisted towards Laren. "Why didn't you," he began, "send someone to the age of the last groundmen with your problem? Better than any 1944 submarine, they'd be able—"

He was talking to empty air. Laren, evidently taking his brief silence for the end of conversation, was swinging strongly upwards a hundred feet away.

Kenlon thought of beckoning him, but changed his mind. He had better start thinking about what he was going to ask the omniscient council.

He was still frowningly preparing his questions minutes later when he grew aware that the flight was leveling off. And that he had come to the end of his aerial journey.

They were not, Kenlon saw, at the top of the building, but about halfway up. An open door, a very large door, at least twenty-five feet wide and high, yawned directly before him. Marble steps led down from it, and terminated in space.

It was one of many such entrances in a building whose grand

dimensions were only now really apparent. It towered and spread. It was wider than it was high. But it was *high*.

It floated in clouds, parts of it hidden in thick mists. He could see the remote upper reaches through shimmering fog; and those heights were at least an eighth of a mile further up.

The building in itself was a city.

Everywhere he looked were winged men and women, in groups and singly, though none were near the door towards which he was being edged. Kenlon gaped at the women. They were mostly too far away for him to make them out clearly.

Of the two nearest him, one had jet-black hair, the other golden. The hair was very long, and whipped behind them as they flew. Kenlon thought of angels, but he was vaguely glad that they came no closer. He had, he thought as his feet settled on the comfortingly hard marble terrace, had no fancy for disillusionments.

"Just walk in, but go carefully," said Laren.

Evidently, he was to remain in his harness, attached to the flyers. The precaution evoked a mind picture of what the inside must be like that was irresistible. Kenlon walked gingerly through the doorway.

He found himself in a well-lighted and vast room. There were great unguarded holes in the floor, in the ceiling, in the walls; gleaming tunnels that fell away into depths, or gave tantalizing glimpses of tastefully furnished antechambers to what must be apartments because there were closed doors visible in some of the horizontal vistas along which Kenlon gazed.

Height untrammeled by too many walls—that was the general effect. Kenlon, his neck arched, his whole manner one of a gaping tourist, walked forward until he felt Laren's withholding pressure on his arm.

Startled, he looked down—at an abyss of a tunnel unguarded by rails of any description. The floor actually curved down, so that there was no sharp edge.

Beyond the curving edge was a gulf forty feet wide and three quarters of a mile deep.

Kenlon reeled back, and then flushed as, beside him, Laren laughed softly.

The winged man said: "Have no fear. The carriers could support you even in a sudden fall. You realize, of course, that in a world where men have wings living quarters will be different."

Kenlon realized silently.

Laren went on: "You are to be taken down about—" He gave the winged men's equivalent of a hundred meters. He finished with an enigmatic smile: "Do not be too surprised at the nature of the council."

Before Kenlon could reply, Laren launched himself down the shaft. The sling tightened around Kenlon. He was swung out and down.

Below him, he saw Laren land, and stand, looking up. An intervening ceiling hid the council room;

then he could see more of the floor beyond Laren. And then—

He was flying.

He was flying. There was no mistaking the movement, the free, the strong, the immensely strong movement. Flying through a thick mist of cloud that hid even the tips of his wings.

His vision included eye awareness of his legs drawn up against his body; and it included blurred visualization of his wings—blurred because the two great pinions were hammering away at the air like the pistons of a swiftly running engine.

His body glowed with power; his whole being exulted with the glory of winged flight. The exhilaration was a tingling joy inside him.

For a long minute that was all there was. Then slowly his brain began to emerge from the state of rigidity into which it seemed to have frozen. The era of pure impression ended. And a personal thought was born, the first of many.

A thought so powerful, so devastating, that his wings ceased their pumping, his body twisted with amazement; he felt bewildered, stunned. And still that thought would not be eased, but rather grew like a storm, becoming more violent with each passing moment:

What—*what*—WHAT had happened?

The winged men had been lowering him towards the council room; the floor of the room was actually coming into his view when—*this!*

Flying! With wings. Actually inside—his brain, his consciousness, his being inside the body of a winged man.

His mind poised in a wondering and dreadful surmise.

They must have done it on purpose. They must have transferred his—essence—into the body of this winged man in order to show him the mental and physical universe of the race.

Kenlon clung to that logicalization, even as awareness came that he was flying again. Without having consciously willed it, he was climbing strongly towards whatever high goal the winged man, into whose body he had been transferred in mid-flight, had been originally heading.

He felt a sudden, intense curiosity as to that goal. He fought on up through the incredible cloud formation, up and up. His wings were soaking wet, but their strength defied the clinging water. The great heart, the mighty lungs, the untiring muscles of the body he bore, accepted every ounce of that terrific strain; and still they climbed.

Kenlon's mind grew immensely weary of that struggle against gravity and the resisting elements; and it was then that he became aware that it was not *he* who was doing the flying.

He tried to stop the wings in their flapping. And couldn't. He tried to end that upward flight, and twist downward—and couldn't!

Dismayed, he ceased the effort. He thought blankly: "I'm just a rider. The brain of the real winged man is still here, still in charge.

I'm being shown. I'm not participating."

But then, what about the way he had stopped the wings from moving earlier?

The answer came to him instantly: The violence of his reaction at the moment of discovering his predicament had succeeded in dominating the nerves and muscles of the winged man. But only for that one feverish moment.

There must be liaison; he must be capable of potential half-control. But it would require a desperate impulse to enforce it.

He had better remain quiet, and await events.

The decision was barely made when the all-enveloping mist began to clear. First he could see the tips of his wings, then the beginning of a second pair of wings, then all around him other wings beating at the thinning air, mounting up now through ever fleecier clouds.

Abruptly, they burst into sunlight, climbed several hundred yards, and leveled off.

Whatever the purpose of it, the tremendous climb was over.

Their purpose could, of course, be to see the sun.

It was reason enough. A month of gray skies had filled Kenlon with a longing to bask in pure, unadulterated sunlight.

If he felt thus, what then must these winged ones feel, whose horizon was always hidden by fog and mist and cloud?

He watched them experiencing the reality of the sun.

For a while they simply floated, wings almost moveless. They seemed to be resting on the great ocean of atmosphere beneath them, with only an occasional shunting of a wing to take advantage of the air that breathed now this way, now that.

Silence lay over that high world. There was a grand dignity about it all, a sense of the spirit ascendant over the strife far below.

Here in this sky loft was peace enough to soothe any soul. The sun shone in a blue, blue sky, a glorious orb of fire in an azure transparency. And there was no feeling of chill, though that could have been because of the gray clothes that fitted so snugly around each body.

There were at least two hundred bodies. They kept gliding in and out, one among the others, so that an accurate count was absolutely impossible. Kenlon judged that half of them were women.

Watching the women, the way their long hair streamed behind them, he thought again of angels; and this time he could see that the description was almost accurate.

They were smaller than the men. Their faces were delicate, finely molded, their hands lovely, somehow untouched by the crude ardor of the wind and the perpetual dampness of the mists below.

It was the women who started the singing. Their voices intruded gently upon the silence, as if first one, and then others, following some secret cue, joined the swelling chorus.

Clear as running water, their voices ran the gamut of a song that was at once almost unbearably sweet yet tuneless, without coherent rhythm or pattern. A universe of sadness and joy quavered in their tones and semitones.

The men took up the words; and now, Kenlon saw, the whole group was flying and singing in unison.

Their song seemed the very essence of the music of an old and gentle race to whom tragedy had come. After a little, Kenlon was able to make out the meaning of the words, though he caught only snatches of the words themselves. Like the music, the words had no rhyme, no meter; and they did not even seem to be broken into verses:

We are the winged.
We sing of ancient glories and of a world to be
When the water is gone, and there is land again
To hold our eager feet.
For a 999 of nine-ones we have kept our faith with destiny.
We have borne children to carry on the race of men.
Their children have borne children.
We have lived as the council advised.
Now we are threatened.
The men of the sea envy us our wings.
They desire to bring us low;
And we have no weapons.
We have no material to build weapons.
We have only the council, which tells us to be brave,
And to carry on in faith and hope for the future.
We have faith and hope in the future,
But we are disturbed; we feel there is need for strong action.
For a 999 of nine-ones we must live our life;
A 999 of nine-ones of waiting, of marking time, of simply living until Earth once more is a green paradise.
Then we will put aside our wings
And go to work.
It will be hard,
For we are the winged.

It was a hymn to the First Cause of the infinite, half longing appeal, half gratitude for existing joys.

The song died as it had begun, gradually, until finally only a single crystal-clear woman's voice sustained a note, that faded towards silence.

The groups were flying swiftly now, in ranks of nines. They wove intricately in and out in a sort of winged dance. Faster, faster—spinning, diving, looping, always, fantastically always in perfect timing.

The maneuver was a hundred times more complicated than any earthly dance, its movements three dimensional, its purpose somehow symbolical of the song that had gone before. Sad with longing, sweet with past joys, tinged with the uncertainty of the present, it ended finally as each group of nine joined into a series of circles around a central group of nine. They hovered there.

A man began a discourse in a grave, gentle yet resonant voice:

"On this day we shall discuss the history of the spiritual development of the mighty groundmen, as revealed by the known sayings of their sages in the last nine years before the catastrophe. Let no one doubt but that mankind attained its spiritual zenith in those dark, brave days; and that in the face of final disaster their true greatness was revealed as never before in the history of this aged Earth of ours. We—"

The voice faded strangely away from Kenlon. The scene dimmed, and withdrew, and then winked out.

The next instant he was swimming.

The water was warm; that was all he knew at first. It was hard to see, mainly, Kenlon realized after a long blank moment, because the body he was in wasn't paying particular attention to surroundings.

Awareness came that there was a strong current running. And that he was idling along in its grasp, with only an occasional plunge of his great arm or leg to aid his swift passage.

He caught a glimpse of the bottom fifty feet below; and there was light filtering in from about an equal distance above. A dozen man-shapes were swimming near him in the dim reaches of water.

He was one of a group of fishmen swimming in a shallow sea perhaps near a shore.

Kenlon's mind reached out to grasp the wider, greater implications. And they were clear and stunning. He was being shown. The fairness of it was absolutely staggering. First, the life and life purposes of the winged men; now the fishmen.

The water was gorgeously warm; and it billowed gently in and out of his gills, in and out, in and out. The action was as natural as all the breathing he had ever done. Kenlon was aware of it only because he concentrated *his* mind on it in a sudden fascination with the very idea of a human being swimming under water like a fish.

After a minute the reality was too normal to think about. It was a part of life, like the steady beating of a strong heart, like the quiet action of a stomach during the process of digestion.

He forgot about it.

His interest turned to what was happening. Wonder came as to where these water people were heading. He had an impression of alert attention to something going on in the sea darkness some distance in front of them.

The realization was like a cue. From out of the night of water came a thrillingly strange cry. It was a human voice, but unlike anything Kenlon had ever heard, a sound molded by the water environment, wonderfully alive, lusty in its piercing quality.

Incredibly, though it was in an extremely modified version of the language of the winged men, he understood every syllable.

It was a warning.

"It's coming!" the voice cried. *"Prepare!"*

He felt himself patting the long knife in the sheath at his side. There was a darkly gleaming flash in the darkness ahead.

A fish, Kenlon saw; a big fish. Twenty feet long at least. A shark! This was a hunting party.

Strong, big, arrogant fish. It swam into plain view, seemed to pause as it saw the semicircle of shapes waiting for it, then disdainfully darted up and approximately between Kenlon's body and that of the fishman next to him.

Faster than the shark, the fishman plunged upward. And they had it. Kenlon's arm closed with a viselike strength around the thick, sturdy body, directly in front of the sinister triangulated fin on the hard back. His long knife slid with beautiful precision into the soft white belly.

Other knives were darting their death thrusts.

The mad threshings ceased finally. The wild beast of the sea turned lazily over, and lay motionless in death.

No, not motionless. It yielded to the pressure of the current, and began to drift swiftly back the way it had come. Kenlon climbed on top of it, jackknifed his legs around its body, and sat casually while it floated into the darkness.

In a few seconds, his companions were nowhere to be seen. He was alone with the dead fish, drifting towards an unknown destination.

The darkness did not last long. He grew aware of a glimmer in the distance. For a moment, a curious moment, Kenlon thought he had gotten his up and sideways directions mixed; and that it was the sun ahead there.

The illusion ended as the shimmering glow widened, and spread into a vast expanse of light.

The city under the sea drew majestically into view.

It was impossible to obtain a good look. To the individual, whose body he shared, all this was completely unmarvelous; the man simply didn't look.

He began to paddle vigorously, as they approached the city. That restricted Kenlon's examination even more. Because his body was intent on the task of breaking free of the current that gripped him and the dead shark.

He made it, apparently with absolutely accurate results, because a minute later he had shoved the shark into a water lock inside the transparent wall of the city, and climbed in after it.

The lock door slid shut; a pump began to work silently. The instant the water was gone, an inner door opened; and Kenlon stepped briskly through it.

He was in the city under the sea.

Kenlon had a conviction that he should feel some tremendous emotion. To be inside the city of the fishmen, he thought, actually inside. To be here to see and examine and judge.

After a second, there was still no

great surge of feeling along his nerves. Memory came of how calmly he had taken the fantastic experience of being in the body of a winged man—after the first shock.

It was clear that emotions in these detached states were on a stabler plane. It all seemed to work on the basis of a tiny percentage of what it would have been in his own body.

He was an Olympian spectator aware of and influenced, but not maddened, by his observations.

Being inside the city meant no more to Kenlon's companion mind than being out. But that very fact now worked in Kenlon's favor. The fishman stood without interest, his mind apparently concentrated on some inner problem, his gaze absently studying the city.

Kenlon had time to observe the main pattern.

The sea city, he decided, was roughly shaped like an enormous igloo. Inside it were a series of ten other igloos, each one progressively smaller by about the radius of a city block than the one before it.

It was an immensely strong and clever arrangement. If the outer wall were breached by the corroding sea, then the second layer would take the stupendous load with the same fervor of resistance.

What was more, only a very small section of each layer could ever be flooded at one time. The layers were divided into sections and floors. He was standing high up, looking down into geometrical processions of lights and floors that extended into distance.

Everywhere were people working. Giants bending over machines, sitting on other machines that pulled loads—doing a thousand tasks, the nature of which was hidden from Kenlon, mostly by distance, partly by the disinterest of his body.

Abruptly, the latter reason became dominant. His body ceased its inactive contemplation, and walked rapidly towards a pile of almost flat metal sheets that, as he came up to them, showed themselves to be not metal.

Kenlon stepped onto the topmost sheet; and, bending down, touched a button Kenlon hadn't noticed till the action was taken. The sheet rose up from the floor, and wafted over to the air lock. Kenlon's large fingers pressed the button again; and the shark was *drawn* up from where it lay in the lock and deposited onto the carrier.

Shark and Kenlon and carrier flowed off at speed down inclined floors towards the lower depths of the city. Kenlon had fleeting glimpses of fishmen working metal at machines, fishmen in laboratories that glittered with what looked like electron tubes, and with strange pillars of light that looked like nothing on earth.

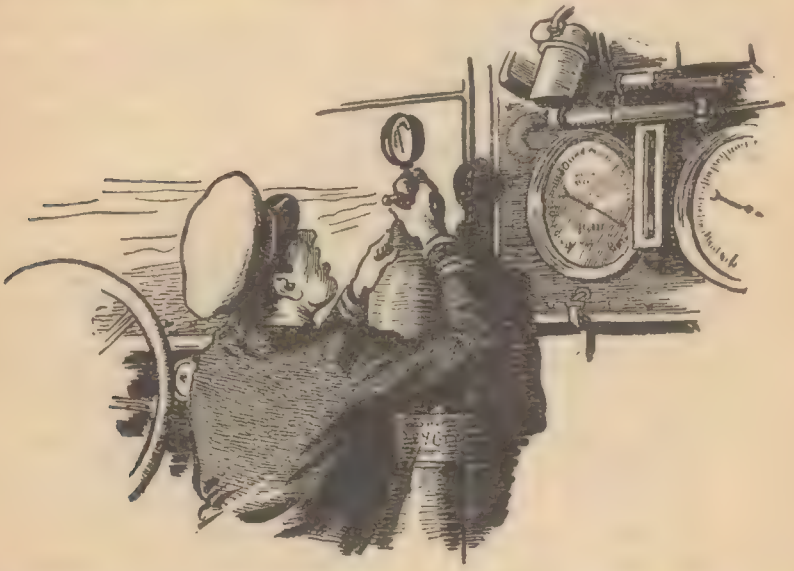
Fishmen working—that was the general picture. Not singing, not dancing, but working. Here was a busy civilization in the making. Human beings with gills, living a savage, semiprimitive existence in a city built by men with whom they

had no more in common than the winged men who had been spawned in the same terrible hour for the same basic purpose.

Beyond all doubt, the fishmen were trying to make something of

murder-intent of the worst kind because the victims had no weapons, no defense.

The moment their sky structure was completely under water, the winged people, with nowhere to



their environment. They were fitting into it, *using* it rather than yielding to it.

In them, the unconquerable spirit of man was manifesting in all its immense and variegated forms, whereas the winged men—

Kenlon shook himself mentally. He felt uneasy. The comparison was unfair. The winged men had no alternative, no opportunity. They could not but live for the future.

And what was more, the lust of and fishmen to destroy the flying men was absolutely inexcusable. It was aggression with a capital A,

land, would drown to the last man, woman and child.

Such a fate shared simultaneously by 239,999 human beings, an entire race was so frightful that—He refused to contemplate it.

But if the alternative was the destruction of the stronger race, what then?

Kenlon drew a mental breath. He was beginning to see the immensity of the human problem of this remote age.

The journey ended abruptly in a room that contained nothing but a great metal machine. It was

metal this time, even at close range. The machine had no attendant; there was no sound of movement from it, nor sign; no activity that affected any of the senses.

The powerful hand of Kenlon's body touched a lever. A hole gaped in the machine. Into this, the shark was drawn by the same invisible power that had originally deposited it on the thin, sheetlike carrier.

The covering glided down on the hole. Kenlon's body stepped off the carrier, and walked rapidly to a nearby door. Its mind seemed uninterested in the fate of the shark; and, after a little, Kenlon pushed it to a far part of his brain.

He was being shown a part of a day's—or whatever they called the time period—activities of one fishman. No portion of those activities mattered particularly. The shark was an incident; so was the present brisk walk. What was interesting was: what next?

He had a feeling that this incarnation was almost due to end. But after at least ten minutes he was still there, still watching the unfolding life of a fishman.

The man carried on conversations but these made sense only in their total effect; the particular sentences and words added mood and fragment, but meant little in themselves.

There was a brief bit, carried on with a chance-met fellow fishman, that went:

"Hail!" said Kenlon's body. "How go the statistics?"

"Deplorably, Getta."

"How many recalcitrants this period?"

"Total 1,111,999. That doesn't include the unknowns born at sea during the last ten generations, and never registered."

"I mean, how many new ones?"

"83,999."

"Our birth rate is greater than that. But I can see your point. The call of the sea is becoming stronger. How many strangers registered?"

"999."

"So few! Hm-m-m!"

They walked on.

Another conversation—with a woman this time, a handsome giantess, who began:

"I'm just up from the mines, Getta. They need help down there."

"I shall pass on the information," Getta responded sardonically. "My own inclinations do not run to grubbing in the earth."

"You men!" the woman reproached. "Always out in the water."

"Mouth breathing is unpleasantly dry and unwholesome."

"That's only your imagination. You were made to breathe in air and water equally well. It's the mystery, the wildness of the sea, not the breathing."

"It's something," Getta acknowledged. "Why not go with me. I'll guarantee you a dozen men."

The woman laughed. "The law that a woman who becomes a recalcitrant cannot return to the city is enough for most of us women. I love the city as much as the sea.

I wouldn't care to be barred from either."

"If you change your mind," said Getta, "let me know."

They walked their separate ways. Another conversation was with a man.

"Whither bound, Getta?"

"To the eastern gate. You know my skill with the water swallowers?"

"I have heard of it."

"It is very important that a revival be accomplished; so says the council."

"Are we still consulting the council on matters of policy? I thought it was used only as a source of science information."

"We consulted it this time. Of course it happened that our general opinion tended the same way."

"Well, good luck."

"Thanks."

It was not long afterwards that Getta-Kenlon arrived at what Kenlon surmised was the eastern gate. There was a lock there similar to the one through which the shark had been originally brought.

After five minutes, something moved in the sea outside. Three bodies; swimming close together.

They surged into the lock; and the water turned whitish as it drained out. The inner door slid open—and Getta faced it for the first time.

Two giants emerged, carrying the limp body of Jones-Gordon. One of them said:

"Well, here he is, Getta. Shouldn't be too hard to revive. Only been in the water for five—"

For Kenlon, the words blurred. Darkness, like an impenetrable mask, engulfed his senses.

He could think. There was no sound, no feeling, no taste, no smell, no sight. But his brain worked.

It was a trembling world of thought in which he found himself, because the thought itself seemed too big for his brain; the thought that—

The skipper was alive.

Or rather *would* be alive as soon as he had been resuscitated by Getta, the expert at reviving water swallowers.

Getta's was probably more than just a human capability. The medical science he wielded must be advanced to an almost infinite point.

Alive . . . Jones-Gordon—

In the darkness, Kenlon's mind writhed in a torment of reaction—and accepted the mighty fact.

It was as if somebody had been waiting for his brain to reach that conclusion. A voice spoke at him.

No, not spoke. For there was no sound; yet there was meaning, outside words impinging on his brain. No flat monologue was that bodiless, soundless voice. It was alive with overtones. It glowed. Richness pervaded every syllable that had meaning.

The voice said:

"Lieutenant Kenlon, you have seen. Now, you must decide.

"The threat to the men who fly is real and terrible. Because it is rooted deep in the logic of human

nature, in this case the logic of the men of the sea, who with remorseless rationalization believe that the two races cannot live together when there is land again.

"Coldly ruthless, they realize that it is easier to destroy now 239,999 winged men than it will be to destroy 999 times that number who will have reproduced in their multiple nine-ones when the land is free again.

"Such is the argument of the seamen.

"In their turn, the winged men have come to feel that only the destruction of the sea city will save them.

"You must choose between them; you must decide. Now, are there any questions?"

Kenlon struggled. In a mental sweat, he fought to bring forth a sound out of the great darkness that held him; one tiny sound that would release his voice to rattle out the questions in his brain.

No sound came. But the questions throbbed, and filled his world —and suddenly the answers came, one by swift one:

"Yes, the fishmen, too, have a council. It is located in the central core of their city. Unfortunately, they use it mostly as a library, and seldom ask its advice. Such is ever the way of strong, youthful races.

"Your commander is even now alive.

"It is impossible to use the time tubes to go for help into the future. The tubes 'lower' or 'raise' objects out of the past from a fixed point.

"Removing matter from one time to another is a very dangerous undertaking. All neighboring space is strained and distorted until replacements are effected. We yielded the information necessary to the construction of the tubes with the greatest reluctance and only under the most rigorous conditions. A key man was required to sacrifice his life the moment he had completed the tubes.

"They cannot be duplicated.

"None of the other vessels from the past is equipped with explosive weapons, which is why they are of no help to the winged men. The groundmen, in constructing both cities, strove to protect them from energy weapons, first by direct defense, second by insuring that neither council ever gave out weapon information. This purpose was accidentally defeated when the seamen discovered a forgotten city, which had sunk into the sea 199,999 years ago. In it, they found among other less valuable devices, the very powerful electronic negator, now being used to drag the city of the winged men into the water.

"None of the instruments, such as the carrier used to transport the dead shark, will work outside the sea city; and the seamen do not know the secret of construction. All this was planned long ago by the groundmen.

"The fact that your commander is alive will make it necessary for you to recapture your ship, in order to prevent an ill-conceived attack on the city under the sea. At no

time did we approve the alliance of the winged men with these creatures of the Sessa Clen. The attack, if it is finally made, will require all the bravery, skill and intelligence of a first-class, highly integrated crew.

"What is more, it will have required that you make a decision, first as to whether or not you will attack the sea city, second, as to what in the city you will attack. You have not the weapons necessary to the destruction of every compartment in that strongly walled city.

"We cannot influence your decision by hypnotism or other force. We have no force at our disposal. Therefore, we desire that, above everything else, your choice be made freely, made perhaps under the pressure of events, but not forced in one direction by gracelessly selfish minds.

"One final suggestion, concerning the recapture of your ship: Your weakness is your strength. Your ship is primitive. The captors of it are bound to make a mistake, to believe somehow that it is better than it is."

Silence fell; then there was light, then feeling.

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"One final suggestion, concerning the recapture of your ship: Your weakness is your strength. Your ship is primitive. The captors of it are bound to make a mistake, to believe somehow that it is better than it is."

Silence fell; then there was light, then feeling.

He was swinging at the end of a sling, being lowered to the bridge of the *Sea Serpent*.

His feet touched the deck. He stood there, dazedly aware that Laren was removing the sling.

With a rush his brain came all the way back into his head. He looked up in time to see the winged

men retreating into the sky like a flock of frightened birds.

He looked down in time to see Dorilee climbing out of the hatch, anger in every line of her face.

"Well, they kept you long enough," Dorilee greeted him acidly. "What did they do to you?"

Kenlon stared at her, puzzled. He had the feeling that he was not hearing aright. At the most he had been away about three hours. Had she expected a trip to the eyrie to last a few minutes? Or was this some attempt at Joannaesque humor?

He parted his lips to say something. And it was at that moment that the astounding things that had happened to him struck into his brain with a bang. He closed his mouth with a click of his teeth. And stood there, stunned.

In a dim way, he expected the memory of it to fade. But after a minute it was still there, not a dream at all. The woman was speaking again, through clenched teeth:

"Your officers absolutely refused to co-operate with me in any way."

She didn't look humorous. Her eyes burned with a bright annoyance. Her lips were drawn into a straight uncompromising line.

Kenlon found his voice. "Naturally," he said curtly. "I am the commander. They will not act without orders from me."

The Tenant said with finality: "We're taking the ship down today whether we receive co-operation or not. If anything goes wrong, I am counting on your desire to save your submarine and your men, to insure that an incident does not become a disaster."

She went on furiously: "Three days! Are the winged men mad that they permitted their council to keep you so long? I notice that they've been staying away from me, and that they permitted Nemmo to give me the location of the sea city. They must have had no control over the situation at all, and are ashamed of their helplessness. Well, they ought to be."

She finished with a rush: "What I'd like to know is, *what happened to you?*"

Three days, Kenlon was thinking. It seemed impossible. Not one of the incarnations, not one of the fantastic episodes had seemed to last more than three-quarters of an hour. Add to that the time necessary for the journey up to and down from the eyrie and—

Three hours, not three days—The logicalization of the sequence was not reassuring. He said slowly:

"I'd like to ask you a question, Tenant."

The tone of his voice must have been conciliatory. Because the woman said quickly, and in altered tone:

"Yes?"

"What did *you* see when you were taken before the council of the winged men?"

Dorilee looked at him with narrowed eyes, as if she was striving to extract special meaning from his question. She said abruptly:

"A roomful of energy tubes. The council is, of course, nothing but a machine made by the now long-dead groundmen. It is an extension of their accumulated knowledge, an automatic brain that knows everything. It has a pseudo-life, but it merely reacts to stimuli on the basis of carefully instilled instincts."

Kenlon absorbed that during a brief silence; then: "What happened?"

Dorilee looked at him. "To me, you mean? Why, the machine simply talked into my mind. It professed to find that our ship would not be useful to the winged men, and dismissed me."

"Oh!" said Kenlon.

There seemed to be nothing at all to say to that. He grew aware that the woman was watching him grimly.

"Well," she said, "do you cooperate, or don't you?"

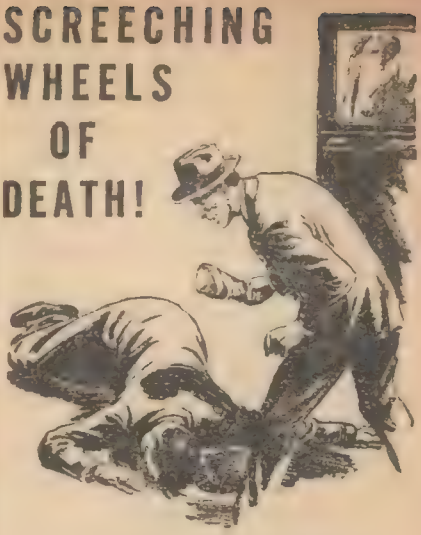
"Co-operate?" echoed Kenlon.

The parrotlike quality of his remark irritated him. But it was also startling to realize that all these minutes she had been standing there expecting him to say yes or no to her proposition, when actually he hadn't given it a thought.

With Jones-Gordon alive *in* the city of the fishmen, he could no more participate in an attack on that city than—

His mind poised there. Memory came of what the council had said: That he would have to stop the attack. Not that he needed the advice. The need for the counteraction grew out of the fact.

SCREECHING WHEELS OF DEATH!



A CAR WAS BEARING DOWN ON HIM. *IT GOT HIM!*

He'd been on his way to see Doc Savage. They were after him: he had plenty of reason to be scared.

So, for that matter, did the whole country! Doc Savage and his aids were faced with a *national* disaster in THE MAN WHO WAS SCARED, in the July issue of

DOC SAVAGE

AT ALL NEWSSTANDS

Important not to let the woman suspect the real reason. Kenlon said slowly:

"From your manner, I feel that you think I have had time to develop a more favorable attitude towards your reckless seizure of my ship. That is not the case. At the moment I have only one desire."

Explanations, it seemed to him, would but serve to confuse the issue. He finished coolly:

"If you have no objection, I would like to talk to Nemmo. I want to question him about what happened to me during my—interview—with the council."

The woman said sullenly: "You still have the neutralizer bar I gave you?"

Silently, Kenlon took it out of his pocket.

"Then go below," she commanded.

A minute later, the Diesels were throbbing; and there was movement.

Everywhere below were Joannas. Kenlon counted twenty from glimpses he had through open doors, including three in the engine room and five in the stern torpedo room, his destination.

The possible total, if those further forward were added, as they would have to be, shocked him. He had been so intent on seeing Nemmo that the problem of regaining control of the submarine had been pushed to the background of his mind.

Now, it jarred to the fore; then receded sickeningly, defeated by the mere contemplation of the odds that were now arrayed against success.

Nemmo was lying on the hammock that had been strung up for him a month before. He sat up when he saw Kenlon.

"I have been waiting for you," he said eagerly. "I was advised a little while ago that you had been returned to the ship."

He smiled in a friendly fashion, yet Kenlon noticed that there was anxiety in his manner. The winged man spoke again, urgently:

"The council kept your mind a long while. We have all been wondering what they showed you and told you. You will help us now, I hope."

Kenlon stared at the man. There was an empty feeling inside him. Nemmo's questions sounded as if there wasn't going to be any clarification from him.

"See here," Kenlon began. He explained swiftly what had happened, omitting only the part about his recapturing the sub. He watched carefully for any revealing expression on the other's face.

There was much there to watch: puzzlement, amazement, disappointment and, finally, when Kenlon came to the fact that Jones-Gordon was alive, sorrowful anger.

"They told you that!" Nemmo said, agitated. "Why, that could have only one result: that you would refuse to help us. They—"

With a visibly enormous effort, he forced silence upon himself. He sat swaying in the hammock, his

wings fluttering. He muttered finally:

"It is not that I wish ill to your commander. But the very existence of a race is at stake. Dozens of winged men have not returned from the time periods to which they were sent for weapons. Death has struck us in every direction, and threatens even greater destruction —and the council told you that!"

Once more he seemed to find it necessary to restrain himself by muscular force. Once more, after a pause, his voice came again at a quieter level. Grim and miserable he said:

"All through this affair, the council has acted with reluctance, as if all its basic credos were at stake. We can understand that in a way. The council was originally constructed to consider both races. What is hard to understand is that in a crisis it has virtually betrayed us."

The winged man faced Kenlon appealingly. "I know that I have no right to ask you, but surely you can launch your torpedoes at vital points of the sea city without endangering your commander's life. I can guarantee that the council will reveal his exact position in the city."

"I wouldn't take the risk," Kenlon answered flatly.

He knew that he was being obstinate, even irrational. It probably could be done. But he knew, shakily, that it was more than just a matter of feasibility.

He hadn't made up his mind about all this. That was the long and short of it. The choice he was being called upon to make wasn't simply a case of picking white from black.

The winged men *were* white. In spite of their hasty alliance with the Sessa Clen, he did not question their motives or their honesty for a single instant.

They were innocents made desperate by unprovoked aggression and bloody murder intent.

But there was something to be said for the black side. There was the wonder and glory of life under the sea. Standing here, Kenlon felt the thrill of that swim, that fight with the shark.

Man beginning a new career in a savage and primitive environment. The prospect appealed to every atom of adventure in Kenlon's body.

Nor were the seamen alone in the universe with their cold logic. Memory came to Kenlon of all the conversations he had had with naval officers in the world of 1944, many of whom had advocated the complete extermination of the Japs.

There was no doubt of it, he personally came from an age where thoughts like that were steady, burning lights in the minds of once-gentle men who hated aggressors.

That was the rub, of course. The fishmen were the aggressors. It was surpassingly hard, though, to think them absolutely black, when the whole fate of man was involved, when the slightest mistake might see man blotted forever from Earth.

Not that total extermination

seemed probable, no matter what happened. Even if their city was destroyed, some fishmen would always survive, though it wouldn't help the race any if they sank to the level of beasts.

Kenlon sighed, then drew a deep breath. One thing was clear. *He* was not ready yet to make a decision.

There was a clang from above. Kenlon jumped, and half turned away from Nemmo. His eyes narrowed to pin points.

"They've closed the hatch," he said. His jaw tightened. "I'd better get up there. I—"

The sound of his voice was overwhelmed by the clattering roar of the Diesels speeding up. The Diesels! Not the electric motors. Kenlon's mind did a spinning dive back to the words of the council:

". . . Your weakness is your strength. Your ship is primitive. The captors of it are bound . . . to believe somehow that it is better than it is."

The Diesels, NOT the electric motors. O God, O Montreal—

Kenlon felt a surging incoherency. He swung around blankly, looking for the tank that he wanted to be near.

He saw it, and threw himself onto the floor beside it.

He lay there, gasping.

One of the five Joannas who had been in the room had gone out a minute or so before; Kenlon recollected that vaguely now, lying there. The four who remained were beginning to stagger. They looked at each other in what must have been a hazy fashion; for their stumblings grew more incoherent. They kept their feet like blind men thrown off balance on a floor suddenly grown fantastically uneven.

Two of the women seemed simultaneously to become aware of Kenlon. They ran unsteadily towards him.

One gasped, "What's happening?"

The moment the question was out, both seemed to lose interest. Clutching their throats, they tottered towards the doorway. All four seemed to have that purpose at the same moment.

Three of the four got safely through and disappeared beyond Kenlon's field of vision. The fourth fell with the groping gentleness of a person overcome by insidious gas fumes.

The air near the floor had more oxygen in it; and, briefly, it seemed to revive her. But she had strained her body to the limit, fought too hard during those frantic minutes.

To make matters worse, she tried to get up.

She sank unconscious onto the floor. There would be others like her in every part of the ship, their purpose, all their will for life defeated by the primitive, ravenous Diesel engines, whose lust for air was so enormous that four or five minutes of monstrous gulping sufficed to exhaust the entire supply of a large submarine.

In the perfect sub, of which their technical books would have told

them, the problem of engines under water must have been solved without the weighty complication of electric motors and batteries.

His thought paused dizzily. He felt a surge of blur over his consciousness.

He drew a shaky breath, and climbed unsteadily to his feet. In a moment he had gently turned on the oxygen tank beside which he had flung himself.

A few life-giving gulps; then he turned it off, and walked, not ran, to the girl lying in the doorway. He removed her energy rod from its belt, shoved it in his pocket, and walked on.

There were five Joannas sprawling the engine room. The marvelously adaptable engines were coughing uncertainly on their diet of almost pure oil.

Kenlon shut them off, hastily grabbed up the five energy rods from the belts of the women; and then, like a diver who has stayed under water too long, he hurried popeyed to the nearest oxygen tank.

This time the oxygen intoxicated him. But he retained enough sense to leave the tap open and to remember his purpose. A gentle hiss followed him as he moved lightheartedly through the sub, removing energy guns from Joannas.

There were forty-four of the Sessa Clen's servants altogether, including the Tenant, who was out cold in the control room.

Kenlon locked their rods in one of the lockers, then carted the Joannas one by one into the forward torpedo room. The various oxygen tanks he had turned on were suffusing the atmosphere with their life; and the women were stirring vaguely as he grimly stripped them nude, and left them.

It was a rude business, but there was no alternative. Some part of their underclothing must make them immune to the neurals.

He had to take all the clothing to make sure that he got the neutralizing elements.

As he emerged from the torpedo room, Kenlon saw that some of the men were recovering, and, what was more, were aware of what he was doing.

For the first time it struck Kenlon that he had recouped his prestige. In that curious world of navy men, this would be an exploit to be told in song and story, if it was ever told at all.

An hour later, when the *Sea Serpent* was again fully manned, and heading back towards the eyrie, he was still lightheaded and lighthearted.

Tedders came up to the bridge.

"The winged man wants to see you, sir."

"Very well."

Kenlon went below.

Nemmo greeted him gravely: "I have just been advised by my colleagues that your commander was brought to the surface by the seamen a few minutes ago. He is alive and well."

In the motor launch, heading towards the shell that contained the commander, Kenlon realized he

felt relieved. In a few moments, chance would have removed the whole problem of this age from his shoulders.

As first officer aboard the U. S. Submarine *Sea Serpent,* he would again be subject to the orders of Lieutenant commander Jones-Gordon.

For him, the time for choosing was over; though, funnily enough, there was an idea now, a solution, come out of the back of his head, an old theory of his.

With a start he grew aware that a mass of winged men were gliding down towards the launch. One of them came very low. Kenlon recognized Laren. The winged man shouted:

"The council . . . has asked us . . . to place ourselves at your disposal. If there is anything we can do—"

There wasn't. Kenlon shook his head at them all even while puzzlement came at the curious offer.

He forgot it, and them.

He found himself wondering what the meeting with Jones-Gordon would be like. He felt strangely on the verge of exciting events.

The meeting was quite unexciting. Jones-Gordon climbed aboard, and shook hands with Kenlon. Almost instantly, he drew Kenlon off to the rear seat. He said sharply:

"What did those winged men want?"

"They offered their help, sir."

"Humph!"

Jones-Gordon sat scowling; then:

"There is no time to waste. I have been kept more or less abreast of affairs, by means of a very curious mind device. Am I to understand our submarine was seized in my absence by the winged men?"

Kenlon described briefly what had happened. When he had finished, Jones-Gordon said:

"I never did trust those scoundrelly winged men."

"Eh!" said Kenlon.

He was startled. It struck him that, put into words, what the winged men had done sounded far worse than the reality. He felt the necessity for explaining their actions.

The queer conviction of impending events was stronger. But somehow it no longer seemed exciting. An odd, ugly thrill touched him.

He began: "Their situation was desperate. They apologized all over the place for what they were doing. They really deserve sympathy. They—"

He was cut off. "Let me decide what they deserve," Lieutenant commander Jones-Gordon sat up very straight. "I might as well tell you, Mr. Kenlon, that I have made a deal with the fishmen. They will return us to our time if we drop torpedoes onto that bird cage up there in the sky, and knock it into the sea. I have agreed to do so."

"WHAT?" said Kenlon.

Jones-Gordon went on as if he had not heard:

"As soon as we are aboard the *Sea Serpent,* you will have our plane lowered into the water. You

"We're scrimping on Paper for Jim!"

CORPORAL JIM'S family knows that the food he eats, the ammunition he uses, the blood plasma and medical supplies which may save his life come to him in perfect condition because they are protected by paper and paperboard. That's why they take every possible means of USING LESS PAPER. From Jim's mother who helps the local storekeepers save paper by carrying her own market basket and never requesting useless wrapping for her purchases, to Jim's kid brother who borrows and lends books, papers, and magazines with all his friends—the whole family is

joining with all the other patriotic Americans from coast to coast who have vowed to save a million pounds of paper for the war effort!

• • •

All the magazines in America, added together, USE only 5% of the nation's paper supply. Yet, out of this comparatively small amount, they are SAVING 450 million pounds this year and RELEASING it for vital war needs.

This advertisement, contributed to the war effort by this magazine, was prepared by the War Advertising Council in cooperation with the War Production Board and the Office of War Information

will oversee the removal of the warheads from four of the new-type sectional torpedoes, and make sure they are properly stowed in the bomb bay of the plane. The machinery which supports the eyrie is at the top of the building. Remove all unnecessary gasoline from the plane's tanks. Flight Officer Orr will see to the aiming!"

"But, sir—" Kenlon said.

He got no further. He couldn't. His brain was reeling before the mad words he had heard; the utter, murderous insanity of the words.

Numbly, he fumbled for a verbal weapon that would nullify what the other had said.

"But, sir — murdering those poor—"

"Nonsense!" The answer was brusque. "It is merely the practical course that I have chosen. We had to ally ourselves with some group in this age. The winged men can do us no harm. The fishmen can. So we work with them."

"The practical course!" said Kenlon bitterly.

Once again, the choking sensation silenced him. He sat sick and cold with horror. He muttered at last:

"I must say, sir, for the first time in my life, I utterly disapprove of your course of action."

He paused, shocked by his own words. It *was* the first time. In all his naval career, he had never questioned, never doubted. He had given advice only when it was asked, and accepted without a second thought every risk attendant on another man's decisions.

Conscious now of his awful temerity, he nevertheless muttered grimly:

"This is murder, sir."

They were looking straight at each other now. Jones-Gordon was angry.

"Mr. Kenlon," he said curtly, "I'll have no more nonsense. We are confronted with a situation whereby a choice is necessary. We must decide between one or the other of two groups in this remote time world. My sole consideration, in making my decision, was to insure the return of our submarine to 1944."

"What you have done," said Kenlon, "will have the exact opposite effect. These fishmen have no time machines. They—"

He stopped. He recognized the stolid look that was settling over Jones-Gordon's heavy face. The officer was closing his mind to arguments.

Here, weighted with the unimaginative character of the man, it held the elements of utter ruin.

Kenlon said, doggedly now:

"This may mean my rank, but I shall have nothing whatever to do with such a fantastic and unworthy plan."

The moment he had spoken, he knew that it wasn't enough. He couldn't just wash his hands, couldn't just look the other way while murder was done.

For a second time within a space of hours, memory came of a phrase the council of the winged men had addressed to him:

We desire that your choice be made freely, made perhaps under the pressure of events but—

Never in all his life had the pressure of events been so great. If only he could have time out to think, some fraction of a day that would give him opportunity for the dignity of consideration.

But there was no time. Murder, cool-blooded murder was about to be done. And only prompt action could avert it.

Quite suddenly, Kenlon knew what that action must be—in all its details.

He glanced with a measuring eye towards the sub. It was still about three hundred yards away. They had hove-to at a good distance, fearing a trap.

Icy cold now, Kenlon glanced up at the winged men. They had been winging along at the upper edge of his vision. They were still there, about a hundred of them, about two hundred feet up.

In that exalted moment of decision, he had not the faintest doubt but that the council, the omniscient council of the winged men had anticipated this moment, this very situation; and had told them. And that they would react to his slightest action.

Kenlon stood up, and *looked* up.

The reaction was faster than his anticipation. Winged men came swooping down. Kenlon shouted at them, articulating the necessary commands.

Jones-Gordon was on his feet. "Hell's bells!" he said, "what are you saying to them?"

This Thin Gillette peps up my day!
I get smooth shaves the easy way—
Look better-groomed—save cash and time.
What's more, four blades cost just one dime!
Rigid Inspection Assures Absolute Uniformity
Gillette
BLADES
4 for 10c
Produced By The Maker Of The Famous Gillette Blue Blade

"I'm telling them to get away, sir. They look as if they're about to attack."

There was no question about that. He had ordered them to seize Jones-Gordon.

The next second everybody aboard was prisoner, their guns tossed overboard, their arms, their bodies, their legs held by strong, muscular hands.

"Hold me, too!" Kenlon had shouted.

And he was held.

Laren came over to him. "What shall we do with your commander?"

"Return him," said Kenlon, "after I have attacked the sea city."

It was little more than an hour later that Kenlon gave the first of the deadly commands:

"Fire one!"

It took time. He had his plan to adhere to, his solution. He had to maneuver, always back to the same position, always firing through walls previously torn by the savage and unerring warheads of the monster torpedoes.

It took twenty-six of their forty-eight torpedoes to reach the central core, where the council of the seamen was sheltered, and to smash that tremendous source of all their knowledge.

When he finally ordered the *Sea Serpent* away, he left behind him a city ninety-five percent intact, but actually to all intents and purposes, headless.

Never again would the seamen misuse the knowledge that had been handed down to them by the ages. Still alive, but all their teeth drawn for a measurable period, they must learn co-operation.

But first, two more torpedoes for the electronic negator that was tugging with its silent power striving to drag the eyrie into the sea. Then deliver the Joannas to their ship, MINUS their encyclopedia and rods. And then—

Jones-Gordon was lowered to the bridge in a sling. He released himself with a brisk movement.

"See that everybody gets below, Mr. Kenlon," he said quietly. "We must submerge to a depth of two hundred feet for safety. We are to be returned at once to 1944."

Nemmo came over and shook hands with Kenlon. "Our council was cleverer than all of us," he said.

Kenlon turned slowly to face his skipper. They were alone on the bridge, and they measured each other with steady glances. There was no questions in Kenlon's mind that the lieutenant commander knew that he had mutinied.

Slowly, Jones-Gordon put out his hand.

"It looks to me, Bill," he said, "that when it comes to finding your way around a crazy world, you've got a more practical mind than I have. You must have, because you were right."

They came up ten minutes after, 994,999 years into the past. They came up into the brilliant sunshine of a south Pacific morning, and looked out on a calm and glittering sea.

THE END.

We're just little people

We're just plain folks . . . but
We're the folks who made this country!
And we're the folks who will save it!

Save it—not only from the Enemy—but from the danger of Prices Getting Out of Hand.

Here we are this year—after we've paid our taxes —with 131 billion bucks in our pockets.
But only 93 billion dollars' worth of goods to buy.
That leaves 38 *extra* billion dollars.

Sure, the easy thing to do is to take that 38 billion and start running around buying things we don't need, bidding against each other . . . forcing prices up and up!

Then people want higher wages. Then prices go up some more—and again wages go up.

And then where are we!

But us little guys—us workers, us farmers, us businessmen—are not going to take the easy way out.

We're not going to buy a single thing we don't need.

We're not going to ask higher wages for our work, or higher prices for the things we sell.

We'll pay our taxes willingly, without griping.

We'll pay off all our debts now, and make no new ones.

We'll *never* pay a cent above ceiling prices.
And we'll buy rationed goods only by exchanging stamps.

We'll build up a savings account,
and take out adequate life insurance.

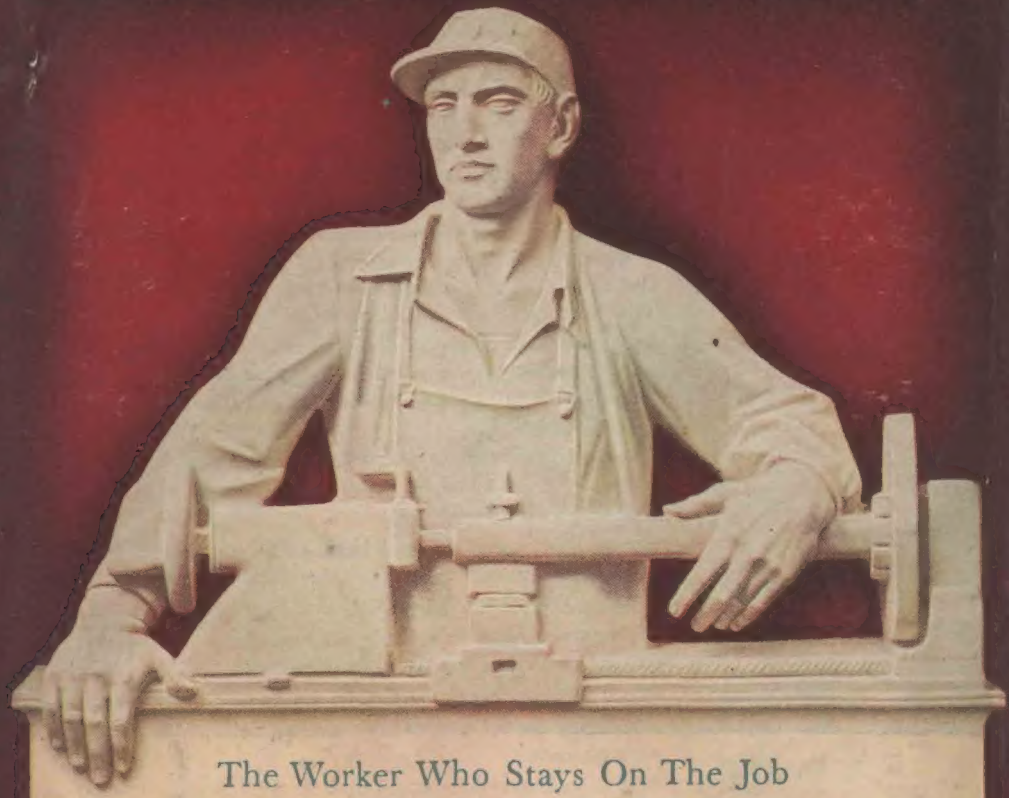
We'll buy War Bonds until it really pinches.

Heaven knows, these sacrifices are chicken feed, compared to the ones our sons are making.

Use it up...Wear it out.
Make it do...Or do without.

A United States War message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by the Magazine Publishers of America.

SALUTE TO A CLEAR-HEADED AMERICAN



The Worker Who Stays On The Job

He knows that minutes count.
Each one is precious to himself—
But precious more
To those who fight, and bleed, and die.

Minutes in which another turning
of the wheel...
Another weapon fashioned...
Another shell made ready for its task...
Can tip the balance of some far-off battle
Not yet fought...
And make the Victory certain—
Where it is only hoped for now.

He stays. Day upon day, he stays
and meets the test...
With purpose clear...and with sense
of honored duty well performed.
He is a Clear-Headed American.

☆ ☆ ☆ ☆ ☆ ☆ ☆

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Science-fiction

JUNE 1944

25 CENTS

TROG

BY MURRAY LEINSTER

ASTOUNDING SCIENCE-FICTION JUNE 1944